ISDM Tailoring on Complex Information Systems Projects

A thesis submitted in fulfilment of the requirements for the degree of
Doctor of Philosophy

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Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

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Like any endeavour which occurs over a lengthy period, it included some very challenging times.

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Abstract

This thesis explores issues related to how methodologies for guiding the development of complex Information Systems ("Information Systems Development Methodologies" or "ISDMs") are tailored in practice.

A model of ISDM tailoring was proposed, refined and tested through case studies. The tailoring of an ISDM was observed in three large, commercial IS development projects undertaken by Sysco, a global provider of Information Technology (IT) hardware, software, and services.

The model represents an ISDM as existing in three states: the Methodology-as-Documented, the Methodology-as-Anticipated, and the Methodology-in-Action. The model also proposes that transitions between pairs of states can occur in two fundamentally different ways:

- Contingent tailoring, which is a pro-active response to known or assumed project characteristics; and
- Improvised tailoring, which is a reactive response to emerging project conditions, drawing on the knowledge and experience of the tailoring practitioner.

Exemplars of the three states, and of transitions of both types between these states, have been identified and documented.

The implications for theory include:

- Identifying and defining the three states in which an ISDM can exist;
- Identifying and defining two types of transition between states; and
- Developing a model which represents the different states and the transitions between them observed in the course of this research.

Implications for the practice of ISDM tailoring include:

- Identifying the need to incorporate into documentation and training materials associated with an ISDM, recognition of the third, intermediate state in which an ISDM can exist, the Methodology-as-Anticipated, and the identification of the two types of transitions between states

These findings are captured in a "Model of Methodology Tailoring", developed and refined in the course of the thesis.

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GLOSSARY OF TERMS AND ACRONYMS

Term	Definition
Agile	A group of ISDMs which have in common an emphasis on iterative and incremental development typically involving cross functional teams for the development of requirements and solution.
BRD	Business Requirements Document – an OzTel Technology Delivery Process (TDP) artefact produced in the Solution Definition phase of that methodology.
BRR	Business Requirements Review – the first of the Systems Engineering and Architecture formal reviews in which the BRD (or BRS if following the Sysco QAM methodology) is reviewed.
CAT	Combined Acceptance Testing – a phase of testing in OzTel's TeleTransform project in which all of the vendors involved in a release are involved. Typically this involves end to end testing of critical business scenarios.
ConMat	Legacy system providing external contractor and materials management capability. Requires payment of an annual license fee by OzTel to the developing organisation.
Contingent tailoring	Contingent tailoring refers to ISDM modification which takes into account known, or planned for conditions (the "contingency variables") or where there are gaps, or documented assumptions. Method Engineering approaches (including the "Situational Method Configuration" aspect of Situational Method Engineering (Bucher, Klesse et al. 2007)) typically adopt this approach to methodology tailoring.
Delivery Process	Within the Sysco Methodology, a Delivery Process represents a form of the methodology, already partially tailored to suit particular types of development projects or problems. For example, there are Delivery Processes for: • Package solution development • Custom application development • E-Business development Once selected for use on a project, a Delivery Process is then referred to as the "Methodology-as-Documented" and is likely to be subjected to further tailoring to meet the specific needs of the project in question.
E2E	End to End
Improvised tailoring	Improvisation in ISDM tailoring makes use of established rules and techniques documented in the ISDM (Vera and Crossan 2005, p.587) and leverages experience, flexibility, and adaptability to tailor the ISDM to suit the characteristics of the situation at the moment of action (rather than it being planned ahead) as in contingent tailoring.
IS	Information Systems
ISDM	Information Systems Development Methodology.
IT	Information Technology
Legacy	An extant system, not one which is being built.

Method Exponent	Within Sysco, a Method Exponent is a professional with specific education, training and experience in tailoring an ISDM to suit the characteristics of a specific project.
Methodology-as-Anticipated	Abbreviated to "M-a-A". The methodology as it exists prior to and in its early stages of application on a project. This will be as it is anticipated following its modification due to a variety of planned for or emergent influences.
Methodology-as-Documented	Abbreviated to "M-a-D". The methodology formalised in a manual or some other format and referred to by Fitzgerald as the "Original Formalized Methodology" (1998b p. 107). See also "Delivery Process" above.
Methodology-in-Action	Abbreviated to "M-i-A". The ISDM "uniquely *enacted* or *instantiated* by the developer" (Fitzgerald 1998b). We take this to be the point where work on developing or preparing artefacts defined in the ISDM commences. Note that early in the project, this may result in influences emerging which drive change to the M-a-A.
MoBill	OzTel system for the billing for use of the OzTel mobile telephony network.
OSS	Operational Support System – an OzTel acronym for those systems which support the operations of its telecommunications business. This includes fulfilment, activation, and network monitoring, but is distinct from Business Support Systems, such as Customer Relationship Management systems, billing etc. The replacement of many of the legacy OSS systems was a key element of the TeleTransform project.
OzTel	Large telecommunications company with a presence in all key segments of the telecommunications industry: fixed line, mobile telephony and internet broadband services.
QAM	Quality Assurance Method – a Sysco method for applying Systems Engineering principles to an Information Technology delivery project.
RDD	Requirements Definition Document - an OzTel Technology Delivery Process (TDP) artefact produced in the Design & Build phase of that methodology. This document follows on from the Business Requirements Document, and identifies those requirements to be IT enabled.
SCP	Supply Chain Program – a Sysco project in which the supply chain operations of the OzTel business are outsourced to Sysco.
SCRUM	An ISDM based on numerous short iterations of design and development effort.
SI	Systems Integration.
SIT	Systems Integration Testing.
SM	Legacy system for the management of network spare parts.
Sysco	Global information technology hardware, software and services provider.
TDP	Technology Delivery Process – OzTel's internal development methodology. Opinions have been expressed that it is not suitable for large, complex, integration projects. Based on the Sysco UMF and SE&A delivery processes.
TeleTransform	A multi billion dollar program of work to reduce the number of

	IT systems within OzTel from over 1200 to approximately 300. This was largely to be achieved through the implementation of a number of "best of breed" packages. The TeleTransform program was to be implemented in a number of phases, each with a number of releases. Thus TR2.1 represented the first release in the second phase of the program. Note – this Transformation Project should not be confused with the transformation of OzTel's supply chain business, descriptions of which form the basis of cases 1 and 2 described in Chapters 5 and 6.
TR2.3	The third release in the second phase of OzTel's TeleTransform Project.
Transition	Within the context of Sysco, transition refers to Sysco taking over the operations of another organisation's business, often including taking on some or all of the organisation's employees, as part of an outsourcing contract. Transition is usually packaged together commercially with a transformation phase.
Transformation	In most outsourcing contracts, the outsourcing organisation hopes to realise benefits by having Sysco operate the outsourced business more efficiently than before. Typically, this requires Sysco to change the way in which the business processes are designed and executed, often accompanied by automation. This process of business process change within the context of outsourcing is referred to as "transformation". Transformation is usually packaged together commercially with a transition phase.
UAT	User Acceptance Testing.
UMF	Unified Method Framework – Sysco's internal development methodology framework.

1 INTRODUCTION

1.1 Overview

"...we see no silver bullet"

(Brooks 1986, p.10)

Frederick Brooks made this statement while reflecting on an observation that software projects typically start out being relatively straight forward, but that they have the potential to transform into monsters of "missed schedules, blown budgets, and flawed products" (Brooks 1986, p.10). In recognition of the capacity for apparently straightforward projects to rapidly transform, finding the "silver bullet", the one technology or management technique that could be applied in order to prevent this from occurring, has been the dream. It was in this context that Information System Development Methodologies (ISDMs) emerged, envisaged as part of the solution to the challenges of Information Systems development.

An ISDM is defined (see Section 2.2.4) as a "recommended means to achieve the development, or part of the development, of information systems, based on a set of rationales and an underlying philosophy that supports, justifies and makes coherent such a recommendation for a particular context". Included within this definition is "the identification of phases, procedures, tasks, rules, techniques, guidelines, documentation and tools,….recommendations concerning the management and organisation of the approach, and the identification and training of the participants" (Avison and Fitzgerald 2003b, p.561).

Research has demonstrated, however, no single ISDM can be appropriate to all projects or all phases of a particular project (Karlsson and Ågerfalk 2009a; Pedreira, Piattini et al. 2007) - each IS development organisation and project is unique. The unique nature of each development situation results in a need for an ISDM to be tailored to suit the unique combination of organisational and project characteristics (Conboy and Fitzgerald 2010).

This thesis investigates the practice of tailoring an ISDM in an individual project. In this thesis, tailoring is defined (see Section 2.4.3) as the modification of an ISDM in response to certain features of a development organisation or project.

Information Technology (IT) plays an increasingly pervasive role in modern society. Whether it be through the provision of banking services, retail, aviation, defence, health or social relationships, its reach is broad and growing. In addition, the complexity of these systems is increasing, with huge volumes of data being collected, greater analytical capability being provided, and increased levels of systems integration expected. Constructing these systems becomes ever more complex and challenging. The focus of the present research is, therefore, on complex, commercial Information Systems (IS) projects. In particular, it investigates the practice of tailoring an ISDM, as it unfolds during the course of evolving, complex, commercial projects.

This chapter outlines the challenges and issues surrounding ISDM definition, use and tailoring (Section 1.2), and identifies the motivations for building, in this thesis, an understanding of tailoring (Section 1.3). It provides context for the two research questions that are investigated (Section 1.4). The design and structure of the study are then introduced (Section 1.5), a chapter by chapter outline of the thesis is provided (Section 1.6), and the major anticipated contributions of the thesis are presented (Section 1.7).

1.2 Background

The history of information systems (IS) development has been characterised by issues concerning developments which failed to meet user needs; systems which were abandoned prior to implementation; and systems which, when delivered, were over time and/or over budget (Beynon-Davies 1995; Lyttinen 1987; Necco, Gordon et al. 1987). Various measures have been proposed and adopted to address these issues. Included in these prescriptions has been the development and use of Information Systems Development Methodologies (ISDMs).

Modern IT systems are inherently complex (Owen and Linger 2011). The use of an ISDM has been advocated as a way of managing such complexity. Reasons cited for their use include that they have the capacity to:

- Improve the outcomes of Information Systems development (Avison and Fitzgerald 2003b; Fenton 1993; Krishnan, Mukhopadhyay et al. 1999; Riemenschneider, Hardgrave et al. 2002; Russo, Wynekoop et al. 1995);
- Improve the productivity of the development effort (Avison and Fitzgerald 2003b; Dietrich, Walz et al. 1997; Krishnan, Mukhopadhyay et al. 1999; Lee and Kim 1992; Leonard-Barton 1987; Nandhakumar and Avison 1999; Walz, Elam et al. 1993); and
- Provide compliance with government and other regulatory and industry standards (Fitzgerald 1998b).

Whilst the use of ISDMs has often been advocated as a means by which to create information systems (Avison and Fitzgerald 2003b; Fitzgerald 1998a; Fitzgerald 1998b; Goulielmos

2004; Krishnan, Mukhopadhyay et al. 1999; Wynekoop and Russo 1993), this is by no means a universally held position. For example, Truex, Baskerville et al. (2000) state that ISDMs may be unsuitable for some development settings. Wastell (1996), questions whether ISDMs actually bring order to a development effort.

The extent to which ISDMs are reported as being used on IS projects varies considerably, with some studies (e.g. Russo, Wynekoop et al. (1995) and Hardy, Thompson et al. (1995)) finding that more than 80% of respondents claimed to use an ISDM, whilst others (e.g. Fitzgerald (1998a), and Riemenschneider, Hardgrave et al. (2002)) have reported that only 40-50% of respondent organisations claimed to use an ISDM.

Whilst there is a wide variation in the reported frequency of use of ISDMs, research consistently shows that where an ISDM is used it is rarely used without modification. For example, Russo, Wynekoop et al. (1995) found that of the firms which claimed to use an ISDM, 85% adapted the ISDM on a project-by-project basis.

IS development is a complex undertaking with each development project potentially representing a unique mixture of features. This is a motivation for tailoring of the ISDM, as IS development "is a circumstantial process, and no one methodology will work best for every context of every project" (Beynon-Davies 1995). Further, it has been noted that "it is now widely accepted that methods should be tailored to the actual needs of the development context" (Fitzgerald, Russo et al. 2003, p.66).

Furthermore, no matter how rigorously a project is planned, nor how assiduously information is gathered or how carefully risks are managed, it is not possible to foresee the future. Consequently, on large projects, conditions and information change in ways which drive the need for in situ tailoring so that the ISDM continues to represent an adequate fit to a project's characteristics.

Fitzgerald (1998b) represents this tailoring in a model he refers to as the "Framework for the IS Development Process" (see Section 2.4.6) and details some of the influences on tailoring. However, a central component of this model is that an ISDM can exist in two states which he refers to as the "Original Formalized Methodology" and the "Methodology-in-action". The concept of an ISDM existing in more than one state also appears in Karlsson's (2002) "Method for Method Configuration" (see Section 2.4.6) in which two states are identified, referred to as the "Base Method", and the "Situational Method". These states are analogous to Fitzgerald's "Original Formalized Methodology" and the "Methodology-in-action" respectively. The concept of states in which an ISDM can exist will be used in the present research to seed the development of an Initial Conceptual Framework (see Section 4.3.1).

Resisting such change by rigorously applying an ISDM may restrict the ability to adapt to emergent changes (Carroll and Swatman 1999; Introna and Whitley 1997). In addition, a preparedness to depart from the documented form of an ISDM allows for the application of creativity or intuition (Carroll 2003; Fitzgerald 1994a; 1995; Russo and Stolterman 2000; Wastell 1996), further enhancing the ability to respond to change.

Whilst ISDM research in the last ten years has moved predominantly to other areas (e.g. agile methodologies, Method Engineering), the fundamental challenge of understanding ISDM tailoring, as characterised by the literature above, remains unresolved.

1.3 Motivation for the Research

Tailoring of an ISDM occurs in order to align an ISDM with a project's known or assumed features. However, the process by which ISDM tailoring occurs in practice on commercial projects is not well understood, either by academics or practitioners (Burns and Deek 2010).

To appreciate the motivation for the present research, two significant observations on the last decade of research, should be noted:

a. Academic interest in ISDMs per se, as indicated by the numbers of papers concerning their generic structure or modification, has waned following the emergence of agile methods around 2002, although their use continues in practice and significant theoretical and practical issues surrounding their use remain unresolved. However, research to date examining the use of agile methods has identified that tailoring of these types of ISDMs is still required (Fitzgerald, Hartnett et al. 2006; Karlsson and Ågerfalk 2009a); and

b. Whilst there has continued to be research into the application of ISDMs, many of these studies have been criticised for shortcomings in their research design, including, in particular, the data collection methods selected, with an emphasis on the use of surveys, questionnaires and/or interviews, which have resulted in the development of post-hoc explanations of tailoring, rather than explanations built upon direct observation.

As a consequence, there is no existing accepted, industry wide, model of ISDM tailoring (Fitzgerald 1997; Fitzgerald, Russo et al. 2003; Rossi, Tolvanen et al. 2000) which theorists and practitioners alike can apply.

The lack of understanding of the tailoring of ISDMs in complex, commercial projects is a principal motivation for undertaking this research, as such research offers opportunities to:

- Develop an understanding of ISDM tailoring as applied in practice;
- Reflect on the appropriateness of ISDM tailoring in practice;
- Identify opportunities for improvement of practice; and
- Better align IS theory with IS practice.

1.4 Research Questions

Given the observed shortfall in theoretical and practical knowledge of ISDM tailoring, the overarching question underpinning this research is:

Why are technologies in use different to technologies as designed?

Addressing this question involves determining whether current understanding of ISDM tailoring, as it occurs in commercial practice, is accurate and, if not, building understanding of ISDM tailoring as enacted in practice. This understanding can then be used to identify potential areas for improvement of ISDM tailoring.

This gives rise to two research questions:

1. What are the components of a model of ISDM tailoring that can be synthesised from the literature, expert opinion and available theoretical foundations?
2. To what extent does the synthesised model of ISDM tailoring reflect contemporary practice of ISDM tailoring as conducted in large, commercial projects?

1.5 Research Design

A research program has been designed to investigate these research questions. The research has been conducted in two phases: a Pilot Study that resulted in the synthesis of an Initial Conceptual Framework, and a second phase consisting of a program of qualitative research that tested and refined this Conceptual Framework.

A Pilot Study was undertaken in the first phase. This was undertaken because examination of ISDM tailoring on large, complex IS projects appear to be under-represented in the literature, and because pilot studies, in such circumstances, help to "…refine data collection plans with respect to both the content of the data and the procedures to be followed" (Yin 2003).

In the course of the Pilot Study, data were collected by two means. First, two laboratory-based workshops were conducted in which highly experienced practitioners were asked to select and tailor an ISDM in response to a problem statement. Second, ten semi-structured interviews were conducted with seven experienced ISDM tailoring practitioners. A key output from the Pilot Study was the development of an Initial Conceptual Framework, which serves to explain "either graphically or in narrative form, the main things to be studied – the key factors, constructs or variables – and the presumed relationships between them" (Miles and Huberman 1994, p.18). This Initial Conceptual Framework addressed the first of the research questions, (i.e. What are the components of a model of ISDM tailoring that can be synthesised from the literature, expert opinion and available theoretical foundations?).

The second phase, the qualitative research phase, examined ISDM tailoring as performed in commercial practice, and addressed research question two (i.e. To what extent does the synthesised model of ISDM tailoring reflect contemporary practice of ISDM tailoring as conducted in large, commercial projects?). It confirmed that the understanding of ISDM tailoring expressed in the literature was incomplete. Consequently, a number of cycles of research were conducted in order to build understanding of ISDM tailoring as it is performed in practice.

At the commencement of the research project, the number of such research cycles required to develop understanding of ISDM tailoring was not known. However, after three cycles of research had been conducted, only small increments to understanding were being obtained. This suggested that saturation of the understanding that is accessible using these techniques had been reached (Strauss and Corbin 1998).

Within each cycle of research, a case study was conducted which examined ISDM tailoring on a commercial project. These three case projects were implemented within and by one organisation (Sysco, a global provider of software, hardware and IT services), on behalf of one of their client organisations (OzTel, one of Australia's largest telecommunications companies). (Note – these are pseudonyms, introduced to maintain the anonymity of the organisations.)

The outcome from the phase of qualitative research was a model of ISDM tailoring, referred to herein as the "Model of Methodology Tailoring" (MMT), extending the model proposed by Fitzgerald (1998b) in his "Framework for the IS Development Process". The nature of the extension is that it identifies a third state in which an ISDM may exist, and proposes that transitions between any pair of the three states can occur in two different ways. The implications of the MMT for improving ISDM tailoring in practice are outlined in Chapter 8.

A diagram of the overall structure of the research project, the two phases, the components of each phase and the chapters in which they are discussed, is presented in Figure 1 below.

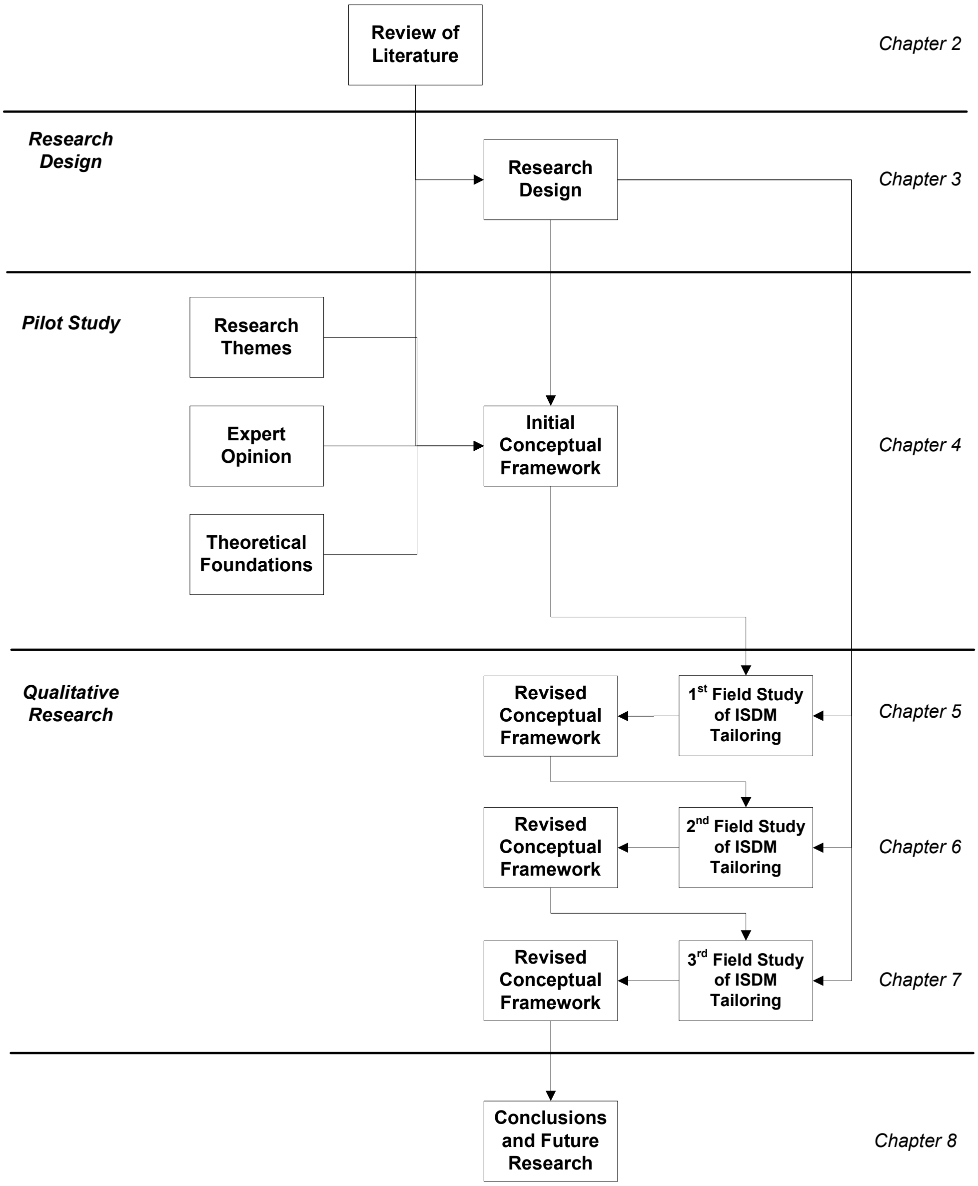

Figure 1 - Structure of the Research Project

1.6 Outline of the Thesis

As highlighted in Figure 1, this thesis consists of eight chapters. A brief outline of these chapters, their content, and context in relation to the overall research design, follows:

- Firstly, a Glossary of Terms and Acronyms is provided, drawing upon the meanings of frequently used terms and acronyms introduced in Chapter 2.
- Chapter 1 (this chapter) reports the background and motivation of the research. It documents the overall question and the two research questions and describes, at a high level, the research design used to investigate them. In addition, it identifies the major anticipated contributions of the thesis.
- Chapter 2 provides a review of the literature relevant to the thesis. Key terms such as Information Systems Development Methodology (ISDM), and tailoring are explored and defined, gaps and shortcomings in the existing body of research into ISDM use are noted, and existing models describing ISDM tailoring are identified.
- Chapter 3 then provides a detailed description of the research design. Issues relevant to Information Systems research are discussed, candidate research strategies identified, and a specific strategy chosen and its selection justified.
- Chapter 4 provides a description of the development of the Initial Conceptual Framework. The Initial Conceptual Framework extends Fitzgerald's (1998b) "Framework for the IS Development Process" and draws on findings from a Pilot Study conducted as part of the research.
- Chapters 5, 6 and 7 report the examination of ISDM tailoring in three case studies involving complex, commercial IS projects. Each case study has used a combination of direct observation, interviews and document analysis to analyse ISDM tailoring as applied in practice. Findings from each case have then been used to develop a validated Conceptual Framework, which was then used to seed the next cycle of research.
- Chapter 8 presents a summary of the findings of the empirical research program, the implications for improving practice, and the contributions of the research to ongoing theory and practice. It also identifies possible topics for further research.

1.7 Contributions of the Research

This thesis investigates ISDM tailoring as it occurs in practice, on complex IS projects. Contributions of the thesis to theory and practice follow.

1.7.1 Contributions to Theory

A model of ISDM tailoring, referred to as the "Model of Methodology Tailoring" (MMT) which identifies and defines key components of tailoring is generated, and constitutes a significant contribution to theory. The model is grounded in the relevant research literature, and refined through a program of field research examining the practice of ISDM tailoring on commercial IS projects. This model extends Fitzgerald's (1998b) "Framework for the IS Development Process" which proposed only two states in which an ISDM can exist.

In a further significant contribution to theory, the model proposes that the transitions **between** states can occur in two different ways: either proactively (called contingent tailoring in this research) or reactively (called improvised tailoring in this thesis). This research provides definitions for each of these concepts.

The case studies conducted as part of the research project, provide rich, practice-based evidence in support of the existence of three ISDM states, as well as offering evidence to support the existence of many of the possible transitions between these ISDM states as postulated in the Initial Conceptual Framework.

Exemplars of the three states, and of transitions of both types between these states are identified and documented.

1.7.2 Contributions to Practice

The research project also makes contributions to the improvement of ISDM tailoring practice in that the identification of a third ISDM state and the different types of transitions between ISDM states, offers opportunities for improving management, practice, documentation and training associated with use of commercial ISDMs, by the inclusion of these concepts.

1.8 Chapter Summary

In this chapter, issues surrounding ISDM definition, use and tailoring have been introduced (Section 1.2). Motivations have been provided for a research program to develop an understanding of ISDM tailoring (Section 1.3). An overarching question and two research questions have been formulated (Section 1.4). Finally, the design of the study (Section 1.5), structure of the thesis (Section 1.6) and anticipated research outcomes have been reported (Section 1.7).

2 FOUNDATIONS OF THE RESEARCH

2.1 Introduction

This thesis builds understanding of Information Systems Development Methodology (ISDM) tailoring, which may support improvements to ISDM tailoring as executed in practice. In Chapter 1, the aim, significance and initial motivation for this program of research was presented. In this chapter, a review of the extant literature pertaining to the definition, history, motivations for use, and tailoring of ISDMs is presented. This review will address the definition of ISDM (Section 2.2), reasons for the use of ISDMs (Section 2.3); the frequency of, and reasons cited for, the modification of ISDMs (Section 2.4); and the present theory base and perceived limitations of existing studies of ISDMs (Section 2.5).

2.2 Defining Information Systems Development Methodologies (ISDMs)

The literature reports a number of definitions related to the terminology (method or methodology) and component elements of an ISDM.

2.2.1 Methodology

One view presented in the literature is that the use of the term "methodology" should be constrained to meaning the "study of method" (Fitzgerald 1994a), rather than using the term as a surrogate for method.

Brinkkemper (1996) uses the term "methodology" to refer to theory building about ISD, saying that the term "methodology" should be restricted to "…scientific theory building about methodical information systems development." As a consequence of this definition, Brinkkemper sees that "…there is just one methodology of information systems development…". The use of the term "methodology" other than to describe theory building is seen by Brinkkemper (1996, p.276) as an indication of the immaturity of the field of Information Systems research, and he advocates abandoning these alternate uses of the term.

Brinkkemper then uses the term "method" to describe what many others have described as a methodology, defining a method as "an approach to perform a systems development project, based on a specific way of thinking, consisting of directions and rules, structured in a systematic way…".

Other authors (e.g. Checkland (1991)), have taken the view that the terms represent different concepts, with an ISD methodology being pitched at a higher level conceptually than a method (in other words, a method provides a greater level of practical detail). In this context, Checkland (1991) sees a methodology not as another word for method, but as '…a set of principles of method which in any particular situation has to be reduced to a method uniquely suitable to that…situation'." In other words, a methodology is a more generic construct, which requires modification before it can be usefully applied to a particular project.

Introna and Whitely (1997) adopt a different definition of methodology, taking a more operationalised position. In their view, a methodology is a "…structured set of techniques and tools that are used to tackle a particular problem, in this case, developing an information system". In this view, a methodology is an organising framework for the development of an information system. Similarly, Sawyer and Guinan define a methodology as "…the set of tasks and their ordering that defines the processes of production" (Sawyer and Guinan 1998).

2.2.2 Method and Methodology

One key differentiator between a "method" and a "methodology", which is posited frequently in the literature, is that a methodology includes some form of a philosophical basis. The concept of an ISDM's philosophical basis typically represents the underlying beliefs of, assumptions about the systems development process, and world views of the developers of the ISDM and which have shaped the ISDM (Avison and Fitzgerald 2003b).

For instance, Iivari (1996) writes that "A methodology will consist of phases, themselves consisting of sub-phases, which will guide the systems developers in their choice of the techniques that might be appropriate at each stage of the project and also help them plan, manage, control and evaluate information systems projects" and states further that it "…is usually based on some 'philosophical' view".

Wynekoop and Russo (1993) also make explicit reference to a methodology being underpinned by a philosophy when they define a methodology as "…a set of guidelines, activities, techniques and tools, based on a particular philosophy of system development and the target system".

The British Computer Society Information Systems Analysis and Design Working Group defined the term ISDM in 1983 (Avison and Fitzgerald 2003b). This definition sees an information system methodology as a "recommended collection of philosophies, phases, procedures, rules, techniques, tools, documentation, management and training for developers of information systems". In the view of Avison and Fitzgerald (2003b), it is the inclusion of a philosophy, either implied or explicitly, which distinguishes a methodology from a method (Avison and Fitzgerald 2003b). They view the philosophy as the "…underlying theories and assumptions that the authors of the methodology believe in and that have shaped the development of the methodology".

The concept of underlying philosophy or "spirit" is also referred to in Agile ISDMs. Cao, Kannan et al. (2009) found that when considering the tailoring of an Agile ISDM, implementations of the ISDM that are not aligned with the spirit (or philosophy) of the ISDM are likely to result in adverse project outcomes when compared to those that are faithful to the spirit (Cao, Kannan et al. 2009, p. 340).

From an operational perspective, the philosophy underpinning a method serves another purpose. As Stolterman (1994) puts it, "If the method is only a description of a superficial logic of work it is nothing there to understand for the user of the method. His only choice is to 'slavishly' follow the recommendations of the method. But if a user understands the meaning and the rationality behind a method he has the possibility to act in accordance with that rationality and still be able to adapt his actions to the specific situation". Thus, the philosophy underpinning an ISDM provides the user with the ability to respond to specific situations which occur in a project.

The importance of an underlying philosophical basis to an ISD methodology is not universally accepted. For example, Hansen, Kautz et al. (2004) comment that ISD methodologies are used in a "…very pragmatic" way and that this pragmatic application of the methodology invalidates the broad application or relevance of the philosophy (Bansler and Bødker 1993; Fitzgerald 1998a; Hansen, Kautz et al. 2004; Madsen and Kautz 2002).

This is supported by Fitzgerald (1998a) who, whilst acknowledging that "…methodologies generally assume some underlying philosophy and fundamental principles in relation to the phases and activities of systems development…", goes on to comment that "…the extent to which methodology users assimilate the deeper underpinning principles of methodologies is questionable" (1998a, p.324).

Within this thesis, the terms "methodology", and ISDM, will be used instead of "method". Subsequent sections of this chapter will present more precisely the definition of methodology, as used when discussing an ISDM, which will be applied throughout the thesis.

2.2.3 A Plethora of Definitions

The definitions of the term ISDM found in the literature vary greatly, both in their formality and in the level of detail given about the structure and contents of an ISDM. Typically those defined in the more recent past tend to be more formal and detailed than those defined earlier.

This reflects an increasing level of maturity in information technology (hardware, programming languages, techniques and tools) and the ISDMs which have developed over time.

However, despite the increase in maturity in IT, and the large number and variety of definitions, there remains no universally accepted definition of exactly what the term ISDM refers to (Iivari, Hirschheim et al. 2001; Iivari and Venable 2009).

2.2.3.1 Abstract Descriptions of ISDM

A high level or abstract view of an ISDM is that provided by Riemenschneider, Hardgrave et al. (2002) who see its function as providing "a comprehensive guide to developing a system" (Riemenschneider, Hardgrave et al. 2002), whilst Sawyer and Guinan (1998) define it as "the set of tasks and their ordering that defines the processes of production". Another high level definition of ISDM is that provided by Truex, Baskerville et al. (2000), who define an ISDM as "…an orderly, predictable and universal approach to information systems development" (2000, p.54). Lyttinen (1987) also provides an abstract definition of methodology, seeing it as "…an organised collection of concepts, beliefs, values, and normative principles supported by material resources".

Fitzgerald, Russo et al. (2002) take another approach altogether. Rather than attempting to define what constitutes an ISDM, they simply see it "…as any formally documented in-house or commercially available systems development approach". Thus, rather than defining what an ISDM is, and then operationalising it by creating instances of it, they take the approach of defining the operationalised forms **as** the ISDM.

Whilst these definitions are very broad, they do allow us to distinguish between the use of an ISDM and ad hoc approaches to software development.

2.2.3.2 Detailed Definitions of ISDM

As a first step in providing a more detailed definition of an ISDM, Brinkkemper (1996) refers to what many others have described as a methodology, seeing it as "an approach to perform a systems development project, based on a specific way of thinking, consisting of directions and rules, structured in a systematic way…". Brinkkemper's reference to a "specific way of thinking" is similar to references to an underlying philosophy for the ISDM.

Introna and Whitely (1997) see an ISDM as a "…structured set of techniques and tools that are used to tackle a particular problem, in this case, developing an information system".

Russo, Wynekoop et al. (1995) define a methodology as a "…framework of phases or activities, within which project teams could adapt the tools, techniques and activities they perform". This definition emphasises the use of an ISDM as a means for structuring development work into a set of phases, whilst recognising that more fine-grained activities require adapting to the specific circumstances of a project. Key to these definitions are the references to directions, rules and tools, reflecting the increased level of detail in the definition.

Conboy (2009) defines an ISDM as encompassing "…the complete range of practices involved in the designing, building, implementing and maintaining an information system, how these activities are accomplished and managed, the sequence and frequency of these activities, as well as the values and goals".

Henderson-Sellers and Ralyté (2010) define an ISDM as "…an approach to perform a software/systems development project, based on a specific way of thinking, consisting, inter alia, of guidelines, rules and heuristics, structured systematically in terms of development activities, with corresponding development work products and developer roles".

Vavpotic and Bajec (2009) define an ISDM "…as a recommended mean to achieve the development of program systems, based on a set of rationales and an underlying philosophy. It usually includes a definition of phases, procedures, tasks, rules, techniques, guidelines, documentation and tools".

However, Bajec, Vavpotic et al. (2007), see definitions such as those above as incomplete as they view an ISDM as consisting of two types of elements:

- "Procedures, rules, directions, tools, standards, etc. which can be documented either in electronic or classical manuals". The more detailed definitions of an ISDM referred to above have included these elements; and
- "…Certain undocumented parts, and above all the knowledge of the organisation members".

Thus, any definition of an ISDM which focuses on documenting the structure and content of the ISDM is, according to Bajec, Vavpotic et al. (2007), incomplete, because it ignores the undocumented knowledge held within the minds of members of the organisation.

2.2.3.3 Elements Common to many Definitions of ISDM

The previous two sections discussed distinctions between the terms "methodology" and ISDM and the different levels of abstraction to be found in definitions of ISDMs.

Whilst there are a large number of definitions, a number of elements recur frequently in those definitions. Some of these elements are that:

- *An ISDM provides for the ordering and structuring of a project*

  An ISDM does this by defining phases (and where necessary, sub-phases) and by specifying the order in which various tasks are to be executed and documents prepared (Henderson-Sellers and Ralyté 2010; Vavpotic and Bajec 2009).

  An ISDM also provides "…a set of guidelines that prescribe a behaviour in order to think and act in a situation" or "…specific, step-by-step strategies for completing one or more phases of the systems development lifecycle" (Wynekoop and Russo 1993).
- *An ISDM includes support for the execution of the methodology*

  This support is typically provided through the provision of defined procedures and techniques, tools, documentation aids, training etc. (Avison and Fitzgerald 2003b; Bajec, Vavpotic et al. 2007; Brinkkemper 1996; Introna and Whitley 1997; Sawyer and Guinan 1998); and
- *An ISDM provides a shared vocabulary*

  Shared vocabularies cover such things as naming of phases, activities, roles, inputs and outputs. The purpose of such a shared vocabulary is to facilitate the capturing, recording and exchanging of information and ideas between practitioners (Avgerou and Cornford 1993; Avison and Fitzgerald 2003b; Fitzgerald 1998a).

These elements of an ISDM, and additional ones, will be elaborated in Section 2.3, in the context of their application, as motivations for the use of ISDMs. The following section (Section 2.2.4) will formally introduce the definition of ISDM used throughout the remainder of this thesis.

2.2.4 Selection of a Definition of the Term "ISDM"

The following definition of "ISDM", provided in Avison and Fitzgerald. (2003b, p. 561) is used throughout this thesis:

An Information Systems Development Methodology (ISDM) is a "recommended means to achieve the development, or part of the development, of information systems based on a set of rationales and an underlying philosophy that supports, justifies and makes coherent such a recommendation for a particular context. The recommended means usually includes the identification of phases, procedures, tasks, rules, techniques, guidelines, documentation and tools. They might also include recommendations concerning the management and organisation of the approach and the identification and training of the participants".

Within this definition, Avison and Fitzgerald have identified a number of components (as discussed in Section 2.2.3) which an ISDM should contain, including:

- A definition of the type of lifecycle used to deliver the Information System (e.g. waterfall, iterative, agile based), including a definition of the phases and sub-phases and identifying any dependencies between phases;
- Specifying the key activities which are to be executed in each phase, guidance on how to execute them, and identifying who is responsible for executing them. This guidance may range from formal face-to-face training courses, or to less formal, online assistance or documented descriptions of them, often in the form of a "Work Product Description", which describe the purpose of the work product, when it is needed, and provides guidance on its preparation (Cameron 2002); and
- Specifying the inputs to and outputs from each phase and each activity and under what circumstances the activities are to be carried out. These inputs and outputs (often referred to as work products) may include standardised templates for the production of such work products. Work products may, depending on the ISDM in question, cover the full gamut of development work, including project management, business process design, organisational change, and requirements, architecture, design, build and test activities.

This definition of an ISDM meets most of the common elements of an ISDM described in Section 2.2.3.3, and is used throughout the remainder of the thesis.

2.3 Motivations for the Use of ISDMs

Four distinct eras of development and use of ISDMs have been identified (Avison and Fitzgerald 2003a, p.79). During each of these eras, the motivation for the use of an ISDM and the emphasis has varied. Table 1 summarises this.

Table 1 - Methodology Eras

Era Name	Period	Motivations for Use of ISDM
Pre-Methodology Era	1960s-1970s	• Poor control and management of projects

		• Lacking in standards
Early Methodology Era	Late 1970s – early 1980s	• Poor control and management of projects
Methodology Era	1980s – late 1990s	• Inflexibility of rigidly enforced waterfall lifecycle
Post-Methodology Era	Late 1990s onward	• Quality of outputs of ISD perceived to be lacking • Development process (including management control, and developer productivity) lacking • Development process not standardised

ISDMs evolved largely to address the perceived shortcomings recorded in Table 1. In the sections which follow, these motivations for the use of ISDMs are discussed. It should be noted that many of the motivations for use of an ISDM are intimately connected – for example, standardisation results in improvements to the outcomes of IS development, as well as improving communication between developers and making the IS development process more manageable.

2.3.1 Outcomes of Information Systems Development

The adoption of the use of an ISDM is often founded in the belief that doing so will result in the creation of an end product of higher quality (Avison and Fitzgerald 2003b; Baker 2011; Karlsson and Wistrand 2006; Krishnan, Mukhopadhyay et al. 1999; Riemenschneider, Hardgrave et al. 2002; Russo, Wynekoop et al. 1995).

One reason for this belief might lie in the very nature of Information Systems development, which, it has been argued, is largely dependent upon personal skills (Lee and Kim 1992). The standardisation of development processes, which is an outcome of the definition of an ISDM, is an essential precursor to the enhancement of the quality of the delivered Information System (Krishnan, Mukhopadhyay et al. 1999, p.269). Standardisation also makes "…projects effective and predictable and increases the likelihood of meeting deadlines, staying within budget constraints, and achieving a desired quality" (Fitzgerald, Russo et al. 2002).

Karlsson and Ågerfalk (2009b) see that a standardised way of working "…makes projects effective and predictable and increases the likelihood of meeting deadlines staying within budget constraints, and achieving a desired quality”. Similarly, adherence to the development process as specified by an ISDM, is believed by some proponents of the adoption of ISDMs to lead to "…consistent, successful outcomes while ad hoc approaches are hit and miss" (Truex, Baskerville et al. 2000).

Russo and Stolterman (2000) argue that many designers are not aware of the basic concepts which represent good design quality, and that the application of ISDMs which are claimed to provide specific, executable guidance and templates outlining both the content and format expected, will result in improved quality outcomes.

Others claim that, by virtue of the standardisation of the development process which is a claimed consequence of the application of an ISDM, productivity and quality is improved (Fitzgerald 1998a).

However, the application of an ISDM has not been shown to necessarily result in improvements in quality. For example, in their study of ISDM use in eight Finnish firms, Smolander, Tahvanainen et al. (1987) found that the ISDMs provided a "…better understanding of design options and problems, not improved productivity or software quality". Similarly, Dekleva (1992) found "…little empirical evidence linking the use of modern IS development methodologies with improvements in development productivity and quality", whilst Fitzgerald (1994b) in his interview-based study of the use of ISDMs commented that "None of the interviewees cited increased productivity or improved quality of systems as benefits arising from the use of a methodology ".

In the sections which follow, some of the ways in which ISDMs might contribute to the development of a better product are discussed.

2.3.1.1 ISDM use makes the development process more manageable

One way in which the use of an ISDM may improve the outcomes of Information Systems development is by improving the process of Information Systems development (Fitzgerald 1998a; Fitzgerald 1998b; Wynekoop and Russo 1993).

This use of an ISDM reflects one of the original purposes of ISDMs, that is to improve "…the management and control of the software development process…" (Omland 2009; Wynekoop and Russo 1993). The size of many projects is such that in the absence of a documented process, the development team can easily be overwhelmed. Providing a good understanding of the development process by documenting it, helps the team to understand how to proceed (Parnas and Clements 1986).

One way in which the understanding of the development process can be improved, is to clearly and unambiguously communicate the structure of the lifecycle which is implemented by the ISDM. That is, the ISDM should explicitly specify the "...the order of the stages involved in software development and evolution and to establish the transition criteria for progressing from one stage to the next" (Boehm 1988). By providing this, the ISDM provides a way of "…organizing systems development tasks…" (Avgerou and Cornford 1993) and provides clarity to the development team as to which tasks should be the focus of their efforts at any point in time. In addition, dependencies between tasks are made explicit, allowing them to be managed better.

Some authors have questioned the value of ISDMs. Wastell (1996) for example, queries the legitimacy of the view that they bring order to a development effort. Rather than acting as a mechanism for the orderly and rational organisation of Information Systems development, Wastell sees an ISDM as a social defence which insulates users and designers from the anxieties of systems development (1996, p.33).

2.3.1.2 ISDM use facilitates communication between practitioners

The development of a large, complex Information System typically necessitates assembling a large team with diverse roles including project managers, architects, developers, users and testers. Effective communication of the problem, proposed solution, status and change is thus important to the ultimate successful delivery of the project (Lee and Kim 1992, p.90). As Walz, Elam et al. (1993) put it, "…team members need to be speaking the same language…in order to share knowledge about the system".

One of the often cited motivations for the adoption of an ISDM in such projects is to provide a means for the team members to communicate effectively (Baker 2011; Karlsson and Ågerfalk 2009b). For example, by providing what he refers to as a "shared frame of reference" in the form of a common language, Wastell (1995) argues that methodologies promote "…learning and cooperation in a community of users and designers". In his study of the application of ISDMs, Goulielmos (2004) noted that all of the firms which participated in his study "…reported that methodologies were used for consistency, coordination, communication and documentation" reinforcing the use of ISDMs for providing a mechanism for enhancing communication (and project management).

ISDMs facilitate enhanced communication in a number of ways. Firstly, they may provide a common vocabulary (which may include common notations e.g. Unified Modelling Language) to enhance the likelihood that a shared understanding of the problem and the solution to be developed can be established (Avgerou and Cornford 1993; Fitzgerald 1998b; Karlsson and Ågerfalk 2009b; Siau and Rossi 2011).

Secondly, explicitly documented ISDMs provide standardisation of key elements of the development approach. These may include specifying the type of lifecycle which the ISDM applies (waterfall, iterative, agile), including naming the phases and sub-phases into which the lifecycle is broken, and specifying the key activities undertaken and outputs produced in each phase.

Another common motivation for the adoption of ISDMs is standardisation. Standardisation may take many forms (for example, standardisation of vocabulary, diagrammatic notations, documentation types and formats, and lifecycle). One of the benefits is an improvement in communication among all parties to the Information System development (Harmsen, Brinkkemper et al. 1994).

Standardisation may also extend to specifying the modelling tools and notations to be used and the types of documentation expected to be produced and the format in which they are produced. Finally, standardisation may extend to specifying the form in which specific outputs are to be produced, often supported by document templates. Templates provide consistency in both the content and its presentation, and facilitate "…intercommunication and interchangeability among developers" (Fitzgerald 1998b).

The development of an information system is a complex undertaking and as a consequence, is difficult to manage and control. ISDMs are often advocated as a means by which the complexity inherent in such projects can be reduced or managed and more effective control of the project implemented (Avison and Fitzgerald 2003b; Krishnan, Mukhopadhyay et al. 1999; Rowlands 2007; Russo and Stolterman 2000; Wynekoop and Russo 1993).

One of the important ways in which ISDMs contribute to improving the manageability of the development process is through standardisation. The specifying of a standard or “ideal” development process makes it easier to assess the progress of a project, and offers the project managers an opportunity to intervene should progress not be as expected (Parnas and Clements 1986).

An additional way in which ISDMs provide improvements in manageability of the development process is by providing transparency of the process (Fitzgerald 1998b). This transparency is itself achieved through the implementation of a phased approach (Fitzgerald 1998b). By breaking a project into phases, there is an opportunity at the end of each phase to assess progress against forecasts, and to take action where necessary to address issues (Fitzgerald 1994a).

The definition and application of an ISDM is also seen as a means of reducing the variability of performance between teams and individual developers, which in turn makes it more feasible to manage, predict and control a project (Lee and Kim 1992), and to provide a mechanism for managing and monitoring the progress of the project (Avgerou and Cornford 1993; Avison and Fitzgerald 2003b).

2.3.1.3 ISDMs are a mechanism for capturing and recording collective knowledge and experience

One way of viewing ISDMs is that they are not so much a mechanism for the exchange of knowledge between designers and developers (as discussed in Section 2.3.1.2), but rather that they act as a way of externalising knowledge (Stolterman 1994). In externalising knowledge, knowledge of the development process is transferred from the user or developer, into the ISDM itself (Stolterman 1994) and is then available for other developers to access. The types of development process knowledge which can be externalised include estimates of the effort and resources required to complete a project, typical risks associated with development projects, and outcomes from previous projects of similar type (Avison and Fitzgerald 2003b). This externalization of knowledge reduces the dependency of an organisation on individuals (Backlund 2002).

Capturing and recording knowledge and experience also allows the development process to be "templated" in order to facilitate knowledge transfer and to enable inexperienced developers to be brought up to speed quicker (Fitzgerald 1998b; Parnas and Clements 1986). Templating the development process also helps to facilitate intercommunication and interchangeability among developers (Fitzgerald 1998b).

Driving this desire for externalization of knowledge of the process of Information Systems development is recognition that organisations tend not to learn from previous experiences (Lubars, Potts et al. 1993). A repository of successful and unsuccessful experiences is one way to avoid the need to “re-invent the wheel” and to prevent making the same mistakes as have been made in the past (Kumar and Welke 1992). An ISDM is one way in which learning from previous development projects can be captured (Fitzgerald 1998b) and shared throughout an organisation (Avgerou and Cornford 1993; Backlund 2002).

2.3.1.4 ISDM use improves the process of systems development

The development of an Information System is a complex undertaking (Goulielmos 2004), and the application of an ISDM has been seen as one way of improving the process of Information Systems development (Chan and Thong 2009; Fitzgerald 1998a; Fitzgerald 1998b; Wynekoop and Russo 1993).

This use of an ISDM reflects one of the original purposes of ISDMs, that is to improve "…the management and control of the software development process…" (Wynekoop and Russo 1993). The size of many projects is such that in the absence of a documented process, the development team can easily be overwhelmed. Providing an understanding of the development process by documenting it, helps the team to understand how to proceed (Parnas and Clements 1986).

One way in which the understanding of the development process can be improved, is to clearly and unambiguously communicate the structure of the lifecycle which is implemented through the ISDM. That is, the ISDM should explicitly specify the "...the order of the stages involved in software development and evolution and to establish the transition criteria for progressing from one stage to the next" (Boehm 1988). By providing this, the ISDM provides a way of "…organizing systems development tasks…" (Avgerou and Cornford 1993) and provides clarity to the development team as to which tasks should be the focus of their efforts at any point in time. In addition, dependencies between tasks are made explicit, allowing them to be better managed.

2.3.2 Productivity of the Development Effort

As was the case with improvements in the quality of the output of an Information Systems development project, there is a belief that their application will result in increases in productivity (Avison and Fitzgerald 2003b; Chan and Thong 2009; Dietrich, Walz et al. 1997; Kacmar, McManus et al. 2009; Krishnan, Mukhopadhyay et al. 1999; Nandhakumar and Avison 1999; Walz, Elam et al. 1993).

For example, the standardisation which comes with the application of an ISDM is believed to reduce the effort required to develop software, whilst the provision of a common vocabulary (see Section 2.3.1.2 above) reduces the effort required to maintain the Information System once in production, leading to overall improvements in productivity (Riemenschneider, Hardgrave et al. 2002, p.1136).

By providing a "….mechanism for less experienced and/or talented developers to perform competently…" (Shaw 1990) in the form of templates, instructions on the preparation of work products and other detailed forms of guidance, ISDMs also enhance productivity, as they provide support to these team members and enable them to be more effective contributors to the development effort than would otherwise have been the case.

Whilst there is some research to support this view, contrary opinions are also expressed. For example, Card, McGarry et al. (1987) found that the application of a collection of software engineering technologies had some beneficial effect on the reliability of the software product, but none on the productivity of the development effort.

As reported in Section 2.3.1 above, Smolander, Tahvanainen et al. (1987) found that the application of ISDMs failed to yield improvements in productivity, a finding echoed by both Dekleva (1992) and Fitzgerald (1994b).

Similarly, McLeod, MacDonell et al. (2004) found that respondents in their survey-based study of software development practices in New Zealand were unconvinced that using an ISDM resulted in increased productivity.

Yet another view is expressed by Rossi, Ramesh et al. (2004), who advocate the use of ISDMs for achieving productivity gains. However, their argument is that standard ISDMs require tailoring to suit specific project needs, and that only then will application of a tailored ISDM result in reduced delays, increases in productivity, and improved quality (Rossi, Ramesh et al. 2004, p.360). The idea that it is the application of an ISDM which has been modified to suit the specific characteristics of a project, rather than the base (or un-modified) ISDM, which results in productivity improvements, is also advanced by Ralyté, Deneckère et al. (2003).

2.3.3 Compliance

It is a requirement of many government agencies to use a specified ISDM when tendering for, and developing, information systems for these agencies. As is the case with all standards, however, there is change over time. In the past for example, the government of the United Kingdom specified the use of SSADM[1], whilst the United States Department of Defence mandated the use of MIL-STD-498 for software development until it was superseded by the more recent IEEE-12207 "Standard for Information Technology Software Lifecycle

[1] SSADM – Structured Systems Analysis and Design Method

Processes”. The requirement to conform to specific standards for development in order to be able to secure work, drives the adoption of specific ISDMs.

Whilst a specific ISDM may not itself be mandated, certain industries with life-critical impacts, such as the health care and aviation industries, have stringent requirements concerning documentation and auditability of the development process. These requirements, in turn, affect the selection of the ISDM used for such projects.

2.4 Studies of the Use of ISDMs in Practice

2.4.1 Frequency of Use of ISDMs

The extent to which ISDMs are reported used within organisations varies significantly from study to study.

For example, Fitzgerald (1996b) reported on the findings of a questionnaire-based survey of ISDM usage and found that 60% of respondents claimed to not use a formalised ISDM. Riemenschneider et al. (2002) reported that "…only about half of all organisations actually follow a methodology". Conversely, in a postal survey, Russo, Wynekoop et al. (1995) found that of the firms which responded, 84% of firms used at least one ISDM, whilst Hardy, Thompson et al. (1995) found that 82% of respondents in their postal survey based study used an ISDM.

In more recent times, “Agile” ISDMs have become popular because of the belief that they provide increased customer satisfaction, lower defect rates, faster development times, and a solution to rapidly changing requirements (Boehm and Turner 2003) when compared to the use of more traditional ISDMs. Whilst such ISDMs have become a focus of recent research into ISDM use, large, complex projects in industry still tend to make extensive use of traditional ISDMs.

Where low rates of use of an ISDM are reported, reasons cited for this include "… ignorance among practitioners" (Fitzgerald 1997) and the perception that " …SDMs are sometimes viewed as valuable and sometimes as a hindrance” (Wynekoop and Russo 1997).

2.4.2 Modification of ISDMs

The literature consistently reports that, ISDMs are rarely used without modification.

Fitzgerald (1998a) reported a questionnaire-based study of 162 development organisations, in which their approach to the adoption and use of ISDMs was examined. As reported above, 60% of respondent organisations in this study claimed to not use a formalised ISDM at all.

However, of the 40% of respondent organisations which did claim to use a formalised ISDM, 58% acknowledged that they did not apply them rigorously. In fact they modified the ISDM.

In their survey-based study of ISDM use, Hardy, Thompson et al. (1995) found that of those respondents who claimed to apply an ISDM as part of their development process, 88% did not apply it rigorously. In the same vein, in their survey-based investigation of the use and adaptation of ISDMs, Russo, Wynekoop et al. (1995) found that of the firms that claimed to use an ISDM, 85% adapted the ISDM on a project-by-project basis.

Whilst there are relatively few studies which have examined the tailoring of "agile" ISDMs, a situation commented upon by a number of authors (for example, Karlsson and Ågerfalk (2009a), Conboy and Fitzgerald (2010), Aydin, Harmesen et al. (2004; 2005), and Paige and Brooke (2005)), the need for an "agile" ISDM to be tailored has been recognised by a number of authors (Abrahamsson, Conboy et al. 2009; Conboy and Fitzgerald 2010; Karlsson and Ågerfalk 2009a; Karlsson and Ågerfalk 2009b).

The reasons for the modification of ISDMs will be explored and discussed in the following sections (Section 2.4.3 and Section 2.4.4).

2.4.3 Defining ISDM Tailoring

An important aspect of ISDM use is the variation in how ISDMs are applied, in particular whether they are applied whole or in part; applied as documented or not; and the extent of modification of specified inputs and outputs. This modification of ISDMs is referred to in a number of contexts (Pedreira, Piattini et al. 2007), with terms commonly used including:

- "customizing" (Fitzgerald 1998b; Hardy, Thompson et al. 1995; Iivari 2000; Kumar and Welke 1992);
- "adapting" (Avison, Lau et al. 1999; Carroll 2003; Chatzoglou and Macaulay 1996; Iivari and Huisman 2007; Iivari and Maansaari 1998; Vigden, Madsen et al. 2004);
- "tailoring" (Boehm 1988; Cockburn 2000; Fitzgerald 1997; Germonprez, Hovorka et al. 2007; Karlsson 2002; McChesney and Glass 1993; Ramesh and Dhar 1992; Rowlands 2004); and
- "adjusting" (Pedreira, Piattini et al. 2007).

In each case, the term is used to mean modification of an ISDM in response to features of a development organisation or project.

Throughout this thesis, for the sake of consistency, the term "tailoring" will be used. "Tailoring" was selected for two reasons. Firstly, there is a long tradition within European IS research into ISDM modification which refers to the phenomenon of ISDM modification as "tailoring" (Fitzgerald 1994a; Fitzgerald 1997; Fitzgerald 2000; Fitzgerald, Russo et al. 2000; Fitzgerald, Russo et al. 2003; Goulielmos 2004; Karlsson 2002; Madsen and Kautz 2002). Secondly, Fitzgerald uses the term "tailoring" when discussing ISDM modification (Fitzgerald 1994a; 1996a; 1997; 1999; 2000; 2000; 2003), and this body of work seeds the development of the Conceptual Frameworks presented in Chapters 4, 5, 6, and 7. In a more general sense, Germonprez, Hovorka et al. (2007) use "tailoring" to refer to the modification of a technology (of which an ISDM may be considered to be an example (Fleck and Howells 2001)) in the context of use.

Definitions of tailoring in the literature vary – for example, the term is used to mean ISDM modification to "fit the circumstances of their use" (Button and Sharrock 1994), "modifying development guidelines for the situation at hand" (Fitzgerald 1996a), "contextualizing the methodology to the circumstances as they are perceived by developers" (Westrup 1993, p.270), ISDM modification to suit "…contingencies of their development situation" or the "…specific needs of their development situation" (Fitzgerald 1997), modification of the ISDM "based on idiosyncracies of project" (Cockburn 2000), or "…the act of adapting standard software process to meet the needs of a specific organisation or project" (Pedreira, Piattini et al. 2007). Xu and Ramesh (2008) define tailoring as "…choosing the process's level of formalism, the types and contents of documentation produced, and the parameters for iterations and releases; defining the roles of stakeholders involved in the process; and adding, removing, or replacing process elements such as tasks and artifacts". An additional important aspect of the definition of tailoring provided by Germonprez, Hovorka et al. (2007) is that tailoring is user initiated.

Common to these definitions is the concept that the ISDM is tailored to suit the characteristics of the project.

2.4.4 Why Are ISDMs Tailored?

Various reasons for ISDM tailoring are reported in the literature. Firstly, there is recognition that no single ISDM is suitable for all situations, because projects tend to differ in the composition of the team, the available resources (time, budget etc.) and in the development context (Karlsson and Ågerfalk 2012). Departure from a rigid application of the ISDM places Information Systems development in a better position to respond to whatever problems and opportunities are presented (Fitzgerald 1994a). This implies a need to understand the processes and rationales for tailoring, so that the designers of ISD methodologies appreciate, and can accommodate this.

2.4.4.1 Rigid ISDM Use Stifles Creativity

One reason for the high rate of tailoring is a belief that the rigid application of ISD methodologies does not allow for the application of creativity or intuition (Carroll 2003; Fitzgerald 1994a; 1995; Russo and Stolterman 2000; Wastell 1996) which may be required when addressing the complexity inherent in Information Systems development. Fitzgerald (1994a), for example, cites early studies into the application of ISDMs and comments that they result in "rigidified thinking".

In his examination of the application of an ISDM, Wastell (1996) found that "…the methodology was being followed in a blind, mechanical way and that as a result the project was becoming bogged down". Fitzgerald (1994b), in discussing pressures against the adoption of ISDMs, commented that there "…is an inadequate recognition of people factors such as personal ability, individual experience, domain knowledge, and learning over time…" and that some ISDMs (Jackson System Development being specifically referred to) have "…the elimination of personal creativity as an explicit goal".

Russo and Stolterman (2000), in challenging some of the implicit assumptions which they believe underpinned the use of ISDMs, posit that system design is an essentially irrational process. They point out that, when considering Information System design, not all problems and opportunities can be anticipated (Russo and Stolterman 2000, p.321). This implies a need for flexibility and innovation in dealing with these emergent problems and opportunities which rigid application of an ISDM may inhibit. The emergence of "Agile" methodologies can be seen as a response to notions of conventional ISDMs stifling creativity. However, there are concerns as to whether "Agile" ISDMs can be scaled to be used in large, complex projects (Qumer and Henderson-Sellers 2008).

2.4.4.2 Flexible ISDM Application Enhances Ability to Respond to Change

Developers often take the view that an ISDM is more a guide than a set of prescriptive rules. As Truex, Baskerville et al. found, ISDMs are used more "…as a parable rather than a procedure. Methods guide rather than direct the developers' process" (Truex, Baskerville et al. 2000, p.71).

It is not only developers, however, that may take the view that an ISDM is more akin to a guide than a rulebook. This may in fact form part of the ISDM itself. For example, Avison and Taylor (1997) state that an ISDM "…provides a basis for constructing a situation-specific method". Similarly, Brinkkemper sees that "…Every project is different, so it is essential in the method configuration process to characterize the project according to a list of contingency factors" (Brinkkemper 1996). This implies that the ISDM, as documented, serves only as a starting point, and that it is fully expected that it will be tailored in order to meet the specific circumstances of a particular development situation (Bucher, Klesse et al. 2007).

With the emergence and emphasis on the use of "Agile" ISDMs in the past decade or so, it is important to recognise that they too need to be tailored to suit the specific characteristics of the project. Bajec, Krisper et al. make this point when they comment that before an agile ISDM is actually applied to a project, "…it has to be adapted according to the characteristics of the project" (Bajec, Krisper et al. 2004). Similar comments are made by Karlsson and Ågerfalk (2009a) who see that the ability to "…adapt the process to current circumstances is one of the principles of the agile manifesto…".

Thus, whilst the selection and application of an ISDM is, according to the literature, an appropriate way of approaching the development of an IS, rigorous application of an ISDM may actually impede or restrict the ability to adapt to problems and opportunities that arise (Carroll and Swatman 1999; Introna and Whitley 1997).

Methodology tailoring, however, comes at a potential cost. Among the reasons put forward for the use of methodologies are to provide standardisation of the development process, and to provide a common vocabulary with which to exchange information. However, this benefit may be lost when adaptation of the methodology occurs. As Carroll (2003) points out, "…a consequence of adaptation of methodologies is that the benefits of standardisation are lost. Also adaptation places greater reliance on individual analyst's skills and experience to select suitable methodology fragments from a toolkit of methodologies, so losing the benefits of methodologies for assisting less able or inexperienced developers".

2.4.5 ISDM Tailoring Approaches

The phenomenon of tailoring has been defined in Section 2.4.3. Here, approaches to tailoring, and the types of events which can be considered as examples of tailoring, are discussed.

2.4.5.1 Method Engineering

Method Engineering (Kumar and Welke 1992) (ME), and in particular, Situational Method Engineering (Brinkkemper 1996) (SME) represent one of a family of approaches to the task of tailoring a methodology. In these approaches, features of the project are taken into consideration in order to produce a project-specific method (Brinkkemper 1996; Harmsen, Brinkkemper et al. 1994; Henderson-Sellers and Ralyté 2010; Ralyté, Deneckère et al. 2003). Key to this is recognition that ME is a meta-method process. Instead of selecting an entire ISDM from an available library, as is the case in other approaches to ISDM tailoring, a new one is constructed or "engineered" in-house from the ground up using existing "method fragments" (Bajec, Vavpotic et al. 2007; Conboy and Fitzgerald 2010; Henderson-Sellers, Serour et al. 2007; Mirbel and Ralyté 2006).

Within the SME space, a variety of potential approaches to the modification of a methodology are posited. These include the construction of a project-specific method (Bajec, Vavpotic et al. 2007) through:

- the reuse of existing method fragments;
- applying documented extension patterns to the base method; and
- application of a "paradigm-based" approach in which a new method is obtained by abstraction from an existing method or by instantiation of a meta-model.

In addition, Method Engineering employs tool and rule based method configuration in order to generate a project-specific ISDM (Bajec, Vavpotic et al. 2007). The tailoring process itself is conceptualised as consisting of a single type of tailoring. One criticism of the Method Engineering approach is that it is impossible to plan for every contingency that may arise, and, therefore, critical fragments will always be missing (Rossi, Ramesh et al. 2004).

The approach to Method Engineering proposed by Brinkkemper includes only a single explicitly identified state – the "Method Base" - however, by inference from Brinkkemper (1996) (see Figure 2), the "Assembly of method fragments" represents an instance of a tailored method. Method Engineering constructs a new ISDM "bottom up", by assembling fine-grained methodology fragments into a new, complete ISDM.

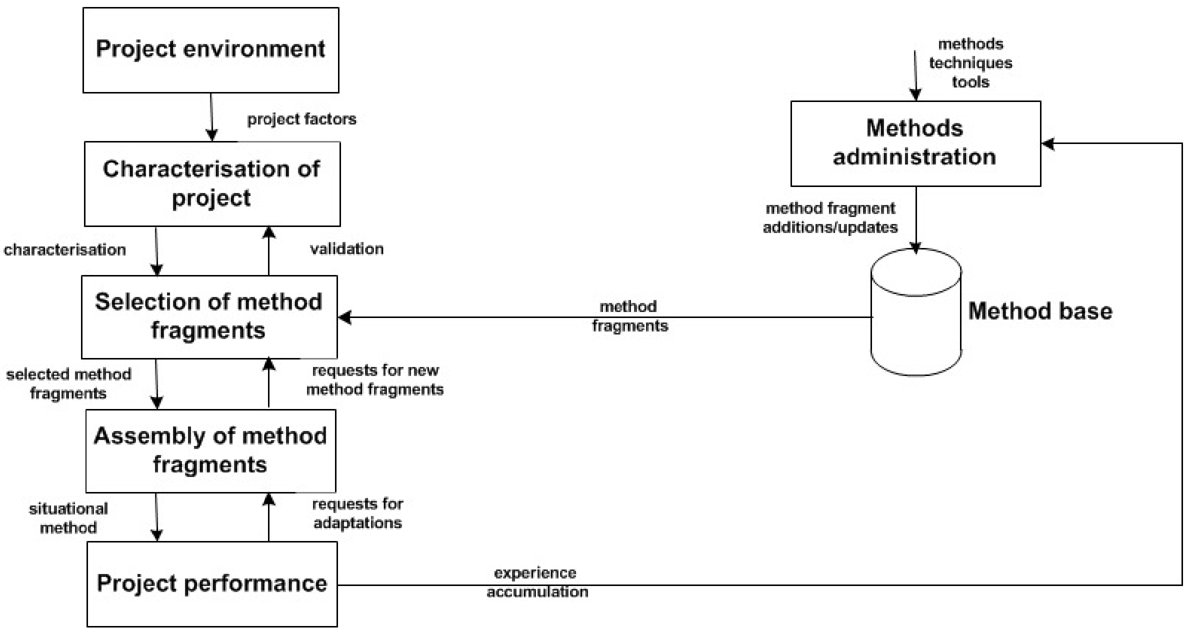

Figure 2 - Configuration Process for Situational Methods (from Brinkkemper (1996))

2.4.5.2 Contingency Approaches to ISDM Tailoring

An alternative for the creation and tailoring of an ISDM to that provided by Method Engineering is a contingency based approach. It relies on the premise that there is no "best" or "universal" ISDM, and instead, a development team should select the most appropriate ISDM for the project from a library of ISDMs (Conboy and Fitzgerald 2010). The identification of the most appropriate ISDM for a project is predicated on the basis that there are a number of variables which influence the performance of the information system (the "contingency variables"). A contingency approach posits that the better the fit of these variables to the design and use of the IS, the better the performance of the IS (Weill and Olson 1989, p.63). Thus a new ISDM is constructed in a "top down" manner, in contrast to Method Engineering (see Section 2.4.5.1) which constructs a new ISDM "bottom up".

Several issues may limit the practical application of a contingency based approach, including that:

- it requires that a large suite of methodologies is available in order to adequately cater for all types of development context and all types and values of the contingency variables (Fitzgerald, Russo et al. 2003);
- it requires users to be familiar with each of the ISDMs (Fitzgerald, Russo et al. 2003);
- despite the intent of the point above, it is impossible to cater for every contingency that may arise on an ISD project, and therefore critical method fragments will always be missing (Rossi, Ramesh et al. 2004); and

- contingency should be built into the methodology itself (Burns, Klashner et al. 2008).

2.4.5.3 The “Smorgasbord” Approach to ISDM Use

Bansler and Bødker (1993) found that rather than applying an ISDM rigorously, developers tended to select some parts of an ISDM and supplemented these with other tools to meet their needs and to overcome the perceived limitations of an ISDM.

Similarly, in their study of the application of an ISDM to two development projects in Norway, Madsen and Kautz (2002), found that the selected ISDM (Rational Unified Process (RUP)) was essentially used as a toolbox of techniques and tools from which elements were selected in a pragmatic way to meet the needs of the projects, rather than as a process framework with which to structure and guide the overall development effort. This finding affirms Fitzgerald (1998a), who found that developers saw an ISDM as a "…framework for the use of tools and techniques" rather than as a guide to development. In reaching this conclusion, Fitzgerald questioned the value of the ISDM's philosophy, arguing that the opportunistic manner in which developers picked parts of an ISDM suggested a lack of understanding and appreciation of the philosophical basis of the ISDM (Fitzgerald 1998a, p.326).

The use of “Agile” ISDMs also appears to involve the selection of practices from a variety of “Agile” approaches. For example, Wang, Conboy et al. (2012) comment that “…existing research has shown that ISD teams often use a combination of XP and Scrum practices”.

2.4.5.4 Adding or Deleting Activities, Phases and Other Elements

When examining ISDM usage in one of several case projects, Westrup (1993, p.272) observed that "…the methodology was rarely evident". He went further, however, than others have done, by characterising the nature of the tailoring of the ISDM. On this particular project, Westrup found that some lifecycle phases specified by the ISDM were executed in detail, whilst others were skipped altogether. In addition to eliminating elements of the ISDM, Westrup found that techniques which did not form part of the documented form of the ISDM were adopted.

There is little literature available which goes beyond Westrup's identification of types of tailoring, although the ME approach described in Section 2.4.5.1 above does discuss the selection of method fragments. However, this is in the context of selecting a number of method fragments and assembling them into a new ISDM, rather than supplementing an existing ISDM.

It is reasonable to assume that tailoring of an ISDM may include the addition, deletion, or modification of elements of the ISDM (where these elements may include one or more of the type of lifecycle; the phases and sub-phases included within that lifecycle; tools and techniques, and key activities, inputs to and outputs from each phase).

2.4.6 Lenses on ISDM Tailoring

There are a variety of ways of examining ISDM tailoring, including: examining the levels at which the ISDM exists (for example, industry, organisation, and project levels); the types of tailoring which can occur; and the states in which the ISDM may exist. In the sections which follow, each of these will be explored.

2.4.6.1 Levels of ISDM Tailoring

The concept of identifying different levels at which ISDM tailoring can occur was used by Fitzgerald, Russo et al. (2003), in their study of the development process in Motorola. This research used a case study approach. A large quantity of qualitative information about a single project was gathered, combined with in-depth personal interviews with the manager responsible for ISDM tailoring within Motorola. In this study, three levels were identified at which ISDM tailoring occurred, described as the "Industry", "Organisational", and "Project" levels, shown below in Figure 3.

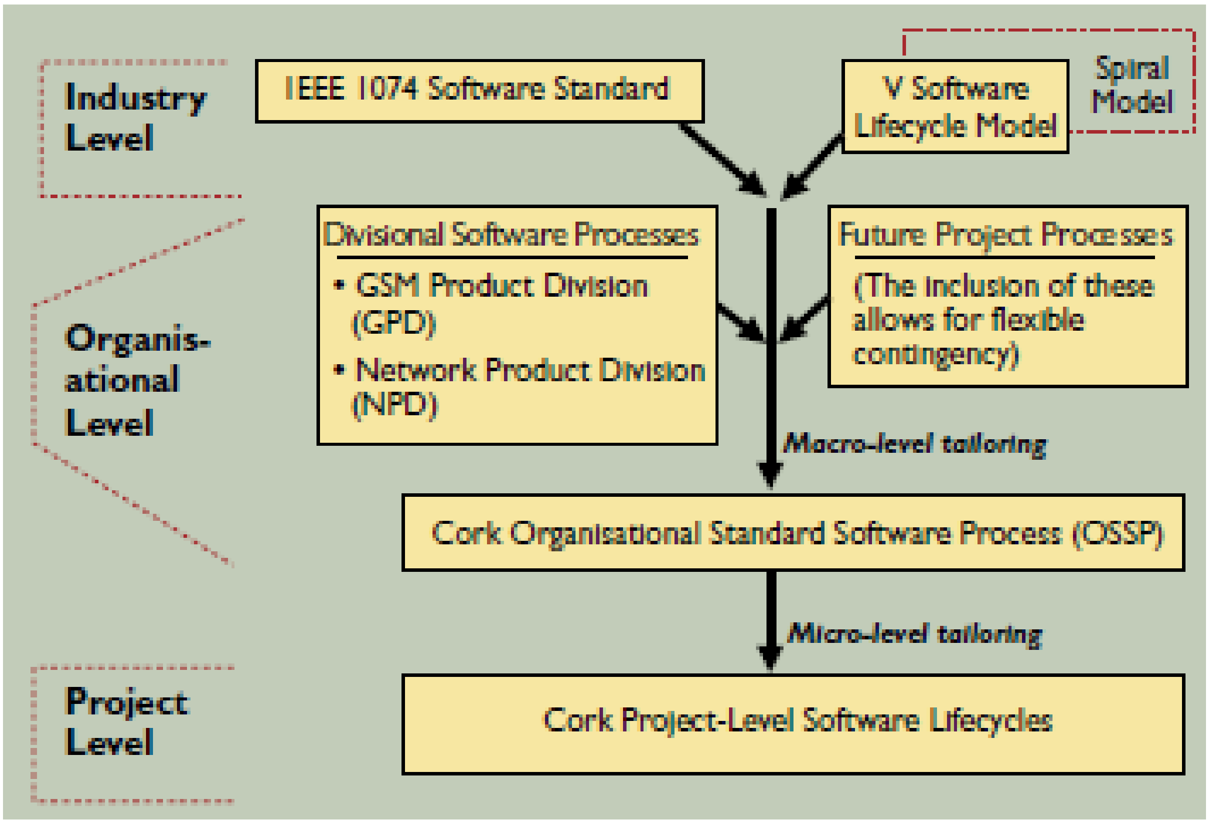

Figure 3 - Three Levels of Tailoring (from Fitzgerald, Russo et al. (2003))

Elements at the “Industry” level refer to those aspects of ISDMs (such as complete ISDMs, or finer grained components of them such as work products) which are available to any organisation which develops software.

“Industry” level ISDMs by their very nature tend to be generic and require tailoring to suit the specific needs of the organisation which is adopting them. For example, particular units within an organisation may tailor the adopted “Industry” level ISDM to suit the specific needs of that unit, resulting in the creation of “Organisational” level ISDMs.

“Organisational” level ISDMs refer to ISDMs which are specific to a particular organisation or part of an organisation and which have been tailored to suit the specific needs of that organisation.

Finally, the “Project” level ISDM takes the “Organisational” level ISDM and factors into it project-specific characteristics to produce an ISDM tailored to suit the unique characteristics of specific projects.

Fitzgerald, Russo et al. (2003, p.68) also identify types of tailoring, in particular, differentiating the types of tailoring which occur at the “Project” level into two types – tailoring planned in advance and tailoring which occurs when project requirements change. They imply that only a single type of tailoring occurs at each of the “Industry” and “Organisational” levels, that being tailoring planned in advance. Given that ISDMs at this level tend not to be used in direct support of development, but more as a starting point for the development of “Project” level ISDMs, this is understandable.

Pedreira, Piattini et al. (2007) also identify that tailoring can occur at multiple levels, referring to both organisational and project level tailoring. Unlike Fitzgerald, Russo et al. however, they do not describe a third level (the “Industry” level in Fitzgerald’s schema).

2.4.6.2 Types of ISDM Tailoring

Orlikowski and Hofman (1997), identified three types of organisational change:

- Anticipated changes: which are “…changes which are planned ahead of time and occur as intended…”;
- Emergent changes: which are “…changes that arise spontaneously from local innovation…”; and

- Opportunity-based changes: which are "…changes that are not anticipated ahead of time but are introduced purposefully and intentionally during the change process in response to an unexpected opportunity, event, or breakdown."

When comparing these types of change to the levels proposed by Fitzgerald, Russo et al. (2003) (see Section 2.4.6.1 above), anticipated changes are equivalent to tailoring planned in advance at the "Project" level. Both emergent and opportunity-based changes can be considered examples of reactive tailoring.

Orlikowski and Hofman (1997) use this model to explain the nature of technological change within organisations, however, in the present research it will be used to underpin our understanding of the nature of the types of tailoring which a methodology may undergo.

2.4.6.3 States of a Methodology

Fitzgerald (1998b) proposes a framework to conceptualise the process of IS development (see Figure 4). Central to this framework, is that an ISDM exists at any point in time in one of two states.

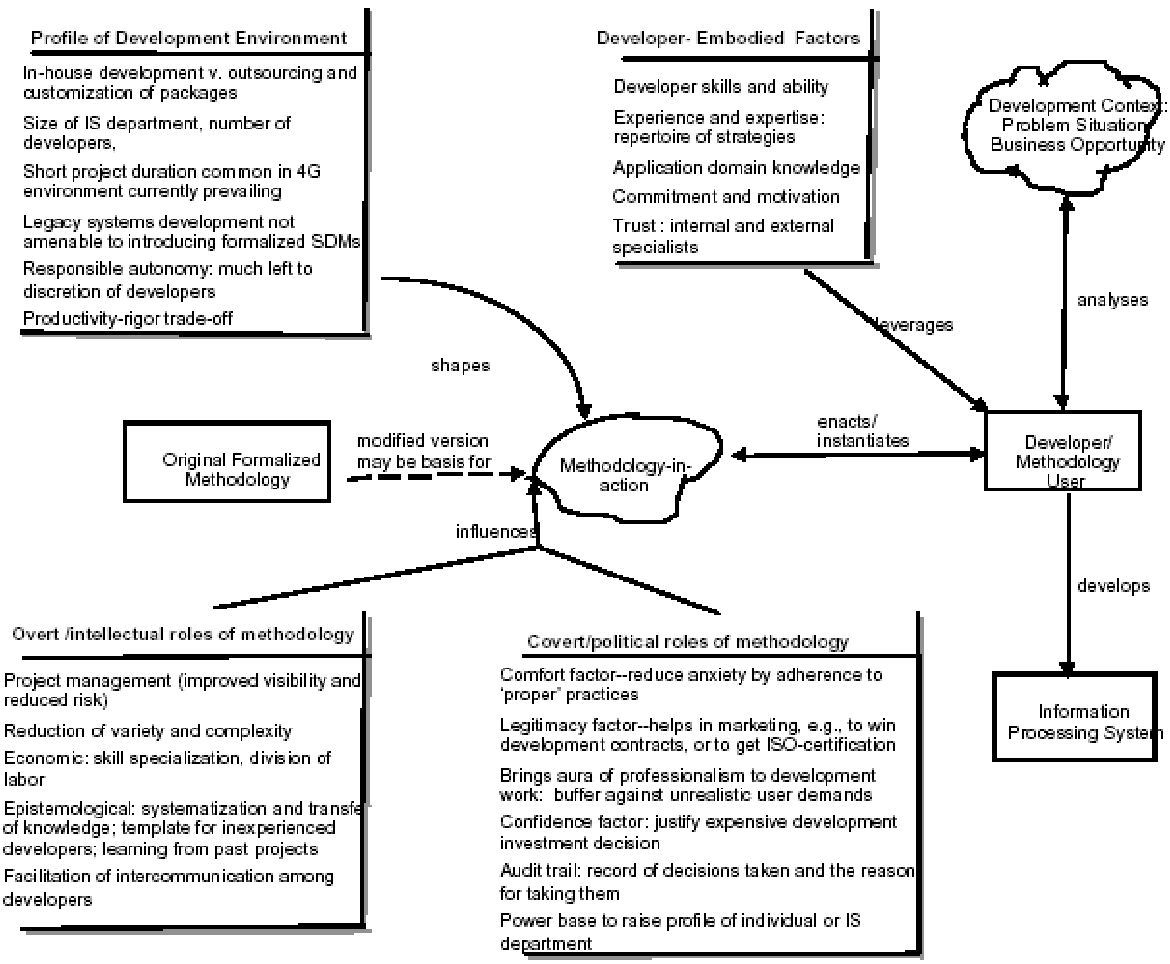

Figure 4 - Framework for the IS Development Process (from Fitzgerald (1998b))

The first state is referred to as the "Original Formalized Methodology", representing the untailored form of an ISDM. The second state, referred to by Fitzgerald as the "Methodology-in-action", is the ISDM tailored to suit the characteristics of a project. Implicit within this model is that such states are an abstract construct and that a new instance of a state does not necessarily mean it is identical to a previous version. Rather, new instantiations of a state are created as necessary.

Karlsson (2002) proposes a model which he refers to as "Method for Method Configuration" (see Figure 5) which also incorporates the concept of an ISDM existing in various states during the life of a project. In this model, Karlsson defines a "Base Method", as the ISDM chosen as the starting point for the tailoring process, which is subsequently "configured" or modified, to suit the exigencies of a specific project. The Base Method is not applied directly to a project; it is the starting point for the tailoring process.

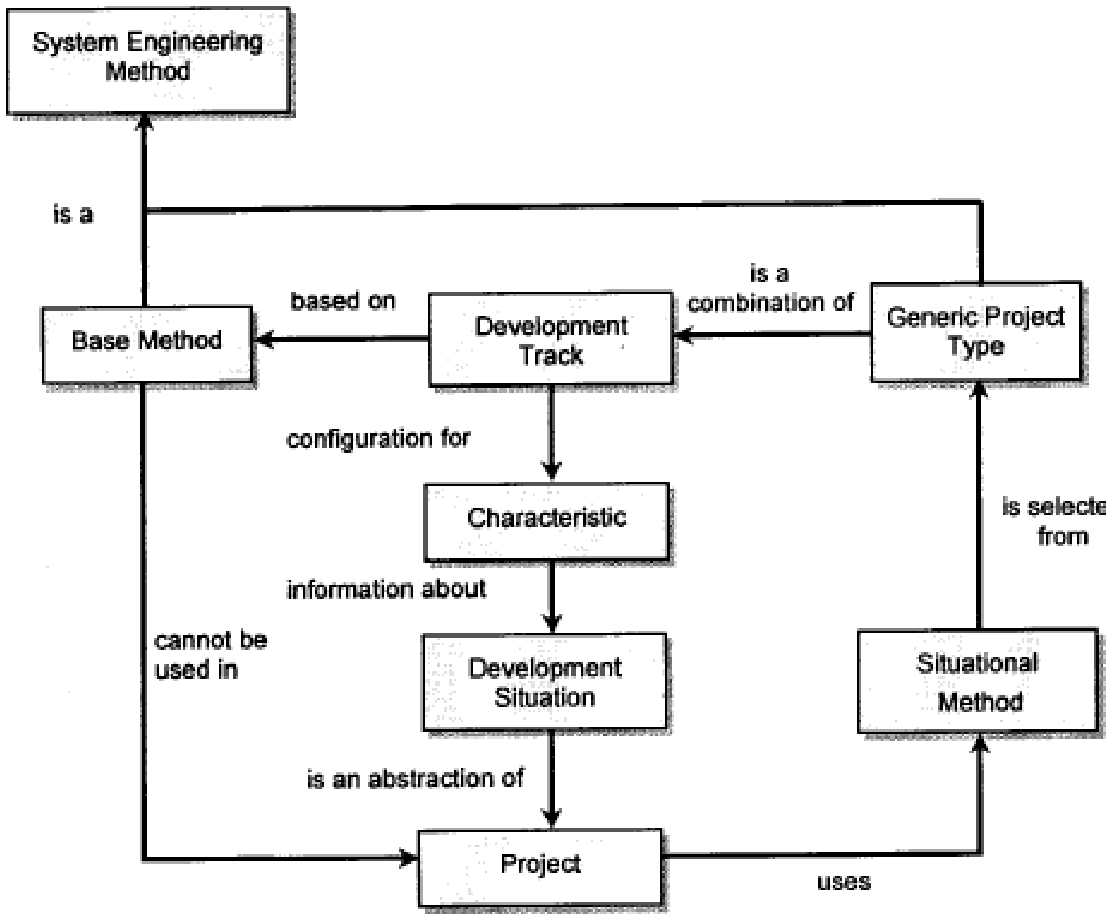

Figure 5 - Karlsson's Model of Method for Method Configuration (2002)

Karlsson's model includes various important concepts. The Base Method is modified to produce the "Situational Method", equivalent to what Fitzgerald (1997) refers to as the "methodology-in-action", as shown in Figure 4 above.

Tailoring is achieved by first identifying the "Development Situation", which is a generalisation of "…one or more existing or future projects with common characteristics". In taking into consideration the essential characteristics of a project, albeit at a particular level of abstraction, it may then be possible to identify similar Development Situations which have been encountered previously. The tailored methodologies developed for those situations may then be re-used (if not completely, at least in part).

Karlsson's model is limited in that it is entirely grounded in theory, and no attempt has as yet been made to test whether the model provides helpful insights into the practice of ISDM tailoring.

The Fitzgerald and Karlsson models have in common the notion that an ISDM exists in at least two states, an original, unmodified form and a tailored form. In the case of Karlsson's model, those are referred to as the "Base Method" and "Situational Method" respectively, whilst Fitzgerald refers to them as the "Original Formalized Methodology" and the "Methodology-in-action".

2.4.7 Situating ISDMs as a Technology

The tailoring of an ISDM represents a specific example of the more generic topic of the tailoring of technologies. A tailorable technology is one which is "intentionally modified in the context of use" (Germonprez, Hovorka et al. 2007) and where the actions of users of the technology are not constrained by "predefined rules or training on how the technology should function or be used" (Maclean, Carter et al. 1990).

One of the central problems confronting the designers of technologies is that the system in question may be used to solve problems which are unique to each user, and for which it is not possible for the designer to anticipate (Germonprez, Hovorka et al. 2007).

Thus, there is a need for such technologies to allow users to initiate change them so as to better address their needs and intended use – key to tailoring, however, is recognition that it is such tailoring is user initiated (Germonprez, Hovorka et al. 2007). A truly tailorable technology is, in the view of Germonprez, Hovorka et al., one which not just *expected* to be modified – rather, the technology is designed in such a way that it is *intended* to be modified (Germonprez, Hovorka et al. 2007).

An ISDM can be considered to be a form of technology in that commercial ISDMs are used as tools with which to develop systems (Fleck and Howells 2001). Further, they can be considered to be tailorable technologies in that when used, they are frequently modified in practice (Fitzgerald 1998a; Russo, Wynekoop et al. 1995). Section 2.4.2 examined the tendency to modify ISDMs, and found that among the motivations for modification of an ISDM was that not all problems and opportunities can be anticipated (Russo and Stolterman 2000). Thus, consistent with Germonprez, Hovorka et al., ISDMs should be subject to user initiated modification – tailoring. It is this phenomenon which will be the subject of exploration in this thesis.

2.4.8 Critique of Prior Research

Sections 2.4.1 to 2.4.6 of this chapter have discussed the literature as it applies to the study of ISDM tailoring. However, this literature also includes references to the shortcomings of the studies, in particular their research design, including:

- *Data collection methods*

  Surveys, questionnaires and/or interviews provide opportunities for respondents to develop a post-hoc rationale of their actions (Tjørnehøj and Mattiassen 2010). For example, in examining how developers applied the Yourdon methodology to a particular problem, Button and Sharrock (1994) found that they did not adhere rigorously to the prescribed methodology. However, when questioned about the application of the methodology, Button and Sharrock found that the practitioners claimed to have used it.

  Several authors have suggested that observation of actual instances of ISDM application and tailoring is necessary in order to avoid the tendency of participants to engage in post-hoc rationalisation. For example, Tait and Vessey (1988) suggest that "…longitudinal studies should be conducted to determine user attitudes at the time of development".

  Similar comments have been made by both Pettigrew (1985) and Vitalari (1985), who have argued that a detailed understanding of the process of IS development should be based on longitudinal studies of systems development.

- *Sample selection*

In their review of controlled experiments in software engineering, Sjøberg, Hannay et al. (2005) found that students participated in 81 per cent of the experiments, whilst professionals took part in just 24 per cent.

Whilst the use of students is understandable, in that for most researchers who operate within a tertiary education setting there is a ready supply of such participants available, the knowledge and skills of a group of students do not necessarily represent those of a group of highly experienced professionals.

In their study of the tailoring of an "Agile" ISDM, Fitzgerald, Hartnett et al. (2006) examined how experienced practitioners undertook this activity within the context of a commercial software development project. Whilst they acknowledged that the use of student teams in the context of a university project would have afforded them greater control over the experiment, they argue that the insights offered as a consequence of the "…realism of context" are as important as the controllability (2006, p.211). In addition, the use of students in place of experienced practitioners may limit the development of understanding of ISDM tailoring in an industrial setting and, consequently, impede the transfer of technology and best practice from the research community to industry and vice versa (Sjøberg, Hannay et al. 2005).

- *Problem type*

  IS development is a complex undertaking (Fitzgerald 1998a; Madsen and Kautz 2002). Examining how an ISDM is tailored to suit the characteristics of a small problem (if indeed it is tailored in such situations) may not provide any insight into the application of such methodologies on complex projects. As Walz, Elam et al. (1987) comment: "…controlled experiments in the field of software engineering are often conducted in artificially designed environments that make it difficult to generalise the results to industrial contexts".

In summary then, whilst there has been some research into how ISDMs are applied, there has been little research which has employed observation of experienced practitioners tailoring ISDMs on large, complex, commercial projects.

The perceived shortcomings of these studies have been commented upon in the literature, leading to calls for research into the actual application of ISDMs in practice (Aydin, Harmesen et al. 2005; Fitzgerald, Russo et al. 2000; Fitzgerald, Russo et al. 2003;

Nandhakumar and Avison 1999; Rowlands 2008; Truex, Baskerville et al. 2000; Westrup 1993).

2.5 ISDM Tailoring Models

Previous sections of this chapter have defined the term ISDM, introduced motivations for using and tailoring them, and provided an overview of existing research in the area. In this section, a number of candidate theories for explaining ISDM tailoring are presented.

The candidate theories presented here are divided into two categories (Orlikowski and Hofman 1997, p.13) based on whether the tailoring of the ISDM occurs as a:

- Pro-active response to known or assumed project conditions; or
- Reactive response to changes in project conditions or emergent information about the project.

No attempt is made in this section to combine these models and assemble them into a single coherent model describing ISDM tailoring. The synthesis of a complete model which describes ISDM tailoring will be presented in Section 4.3.1.

2.5.1 Models of Pro-active ISDM Tailoring

Pro-active models of behaviour are based on the idea that a response to known or assumed conditions is prepared and executed. In essence, with pro-active tailoring, there is planning, selecting and tailoring of an ISDM before action occurs. By contrast, when adopting a reactive approach, the planning, selecting and tailoring occurs concurrently with the action.

One model suited to pro-active tailoring was identified (contingency), and is discussed.

2.5.1.1 Contingency

Contingency approaches are founded in the belief that there is no single, best way to achieve success when managing or planning and that every development situation is unique (Fitzgerald 1994a). Contingency theories hypothesise that a "…number of variables influence the performance of information systems; the better the 'fit' between these variables and the design and use of the MIS [Management Information System], the better the MIS performance" (Weill and Olson 1989, p.63). A contingency method then, is a "…situation-specific method for certain types of organizational settings" (Rolland 2009).

Applied to ISDMs, this position argues that an ISDM should be appropriate both to the type of project being undertaken, and to the group undertaking the work.

A key assumption which underpins contingency theory is that those involved in systems development act rationally (Weill and Olson 1989, p.65). However, many authors have identified that much of Information Systems development is, in fact, not shaped by rational analysis, but is influenced by political, social and other human power issues (Fitzgerald 1994a; Rowlands 2004; Russo and Stolterman 2000; Truex, Baskerville et al. 2000). Not tackling these issues reduces the likelihood of successfully delivering the Information System.

Zhu (2002, p. 343) examined contingency with a particular emphasis on its application to ISDMs, and identified three types of contingency approach:

- Contingency at the outset – choosing a single methodology or a fixed combination of methodologies for the whole lifecycle of an IS project based on the assumption it is possible to classify project types and to match them with corresponding development strategies. This approach does NOT explicitly take into consideration human issues (Zhu 2002, p.346).
- Contingency with a fixed pattern - this approach refers to selecting ISDMs according to a conceived linear working sequence of human-technical issues in the ISD process, the best example of which is Multiview (Zhu 2002, p.346). Multiview takes human issues into consideration explicitly (Zhu 2002, p.347).
- Contingency along development dynamics – this approach, developed by Zhu (2002) sees IS development as fundamentally unpredictable, due to various issues which "…interact continuously with each other in an unpredictable manner" (Zhu 2002, p.348), rendering a predefined sequence for development inappropriate. According to Zhu, it is only as the complexity of IS development unfolds, that the issues and their interactions can be understood. Thus methods and tools should be selected as the complexity of IS development unfolds dynamically (Zhu 2002, p.348). Whilst Zhu describes this approach as "Contingency along development dynamics", the description provided has more in common with an improvised approach (see Section 2.5.2.4) with its emphasis on adapting while acting.

Potential issues with a contingency approach to ISDM tailoring include:

- Developing an in-depth understanding of the problem situation requires a considerable time commitment;

- Organisations which engage in IS development projects of a variety of types need a library of ISDMs from which the most suitable one for a specific project can be selected (Bajec, Vavpotic et al. 2007);
- There is a need for a very broad range of skills and experience in order to be able to select, tailor and implement the appropriate ISDMs for different sets of project contingencies; and
- At the commencement of a project, not all information which may impact on the application of the ISDM is known. Information which emerges later may result in the contingently tailored ISDM no longer representing a good fit for the project's contingency variables.

Contingent tailoring of an ISDM is often viewed as being used at the start of a project, and relates to the perceived project situation at that time (Carroll 2003). However, it has been shown that as further information is gathered from a variety of sources, more planning can be undertaken, with potential additional contingent tailoring of the ISDM occurring (Carroll 2003).

2.5.2 Models of Reactive ISDM Tailoring

Reactive models of behaviour are based on the idea that a response to emergent conditions is prepared and executed. In contrast to a pro-active approach to ISDM tailoring, where conditions are perceived in advance and tailoring decisions are made based on those conditions, a reactive approach occurs when information emerges which was not foreseen. In such circumstances, a contingency approach is not appropriate. Such an approach would require developers to stop, to undertake an analysis of the nature of the changes to conditions, develop an approach which is appropriate to those changes, and then implement it.

Amongst a number of models of such approaches, four are now discussed (Appropriation, Situated Action, Opportunism, and Improvisation).

2.5.2.1 Appropriation

Appropriation is a model of technology use which recognises that the users of a technology adapt or modify it to suit their particular needs, and which describes the manner in which users “take possession” of a technological innovation over time (Carroll 2004; Fidock and Carroll 2011).

The modification or adapting of a technology may result in a disparity between the intentions of the designer of the technology, and the actual use of the technology. Some researchers have argued that modification of a technology away from its designers' intent is "dysfunctional" (DeSanctis and Poole 1994), and that this prevents maximum benefit being derived from the technology. Other researchers, however, have taken a different view, recognising that "…technologies are designed around a set of assumptions concerning what work processes are required and how they will take place that are often simply wrong" (Gasson 2003, p.32) and that as a consequence, modification of the technology is central to the successful use of the technology.

Furthermore, as a consequence of the different settings, context and assumptions which they are subject to, different users may adapt the same technology in different ways (Carroll 2004).

The Model of Technology Appropriation (MTA) proposed by Carroll (2004) describes the way a technology is transformed from its "as designed" state into its "as used" state. Figure 6 below (taken from Carroll (2004)) represents a technology as being in one of three levels:

- Level 1 – the user undertakes an initial evaluation of the "Technology as Designed" based on the features of the innovation, and the user's perceptions of its value in that context.
- Level 2 – users continue to evaluate the technology as they apply it, and as they do they adapt it, and adapt to it. The features of the technology may make it easier to perform some activities whilst rendering others more difficult or impossible.
- Level 3 – over time, the adapted technology becomes incorporated into users' activities and is stabilised. It is said to have been "appropriated" and is referred to as the "Technology in Use".

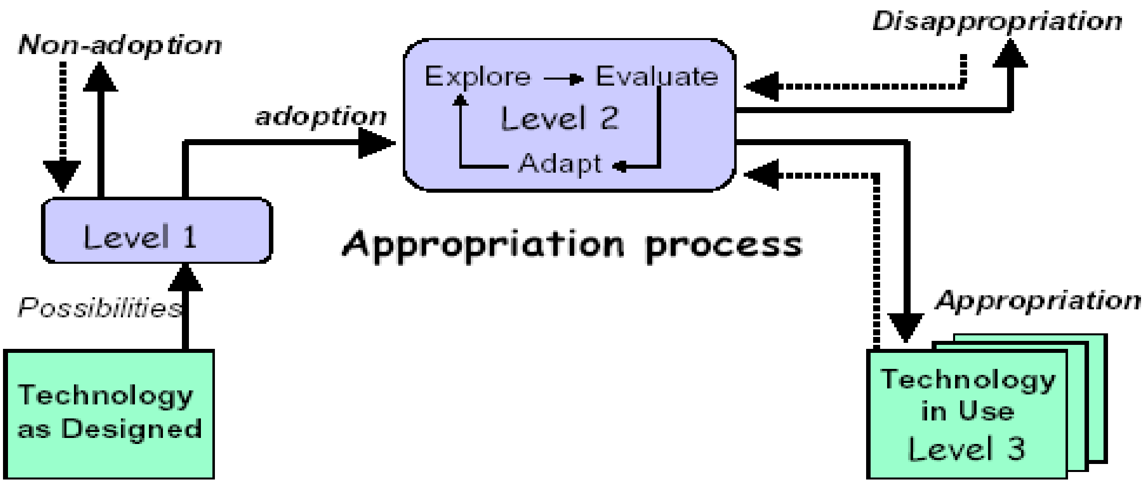

Figure 6 - Model of Technology Appropriation (from Carroll (2004))

The MTA has some elements in common with Karlsson's "Method for Method Configuration" (shown previously in Figure 5), and Fitzgerald's "Framework for the ISD development process" (shown previously in Figure 4). All three portray an ISDM as potentially existing in a number of states, with levels 1 and 3 of the MTA being similar to the "Base Method" and "Situational Method" identified by Karlsson and the "Original Formalized Methodology" and "Methodology-in-Action" respectively, identified by Fitzgerald.

2.5.2.2 Situated Action

Situated action is a model of behaviour which contrasts "…routine activity situated in an environment with theories of deliberative action" (Gregor 2006). Since it is not possible to foresee every change which will impact on a project, the ability to respond in a spontaneous manner is critical (Crossan 1998, p.595).

A situated approach accepts that change will occur, and emphasises learning from and adapting to changes in the project's circumstances (Crossan 1998, p.595).

A situated theory of learning is founded on the idea that knowledge itself is not absolute, but rather the setting or context in which the knowledge is placed is important (Tyre and von Hippel 1997). Should the setting change, answers to the same questions or responses to the same problems may change as a consequence, as different settings provoke different types of thought and action (Tyre and von Hippel 1997).

Intelligent actors in a situated learning environment draw on "…codified, abstract theory", combining it with the specific social and physical circumstances of the particular setting to turn them into "…local, informal routines" in order to get the task completed (Tyre and von Hippel 1997).

It is important also to recognise the importance of the creation of "local, informal routines" – in their study of the way in which machine repair technicians operated, Brown and Duguid (1991) observed that "…the ways people actually work usually differ fundamentally from the way organisations describe that work in manuals, training programs, organisational charts, and job descriptions" (Brown and Duguid 1991, p.40). A key input into these "local, informal routines" is not what is formally documented or taught, but rather from informal story-swapping among users about their experiences in different situations (Tyre and von Hippel 1997).

Situatedness, that is learning from, and adapting to, the circumstances of the project is a key feature of improvisation.

2.5.2.3 Opportunism

Opportunism as it applies in the context of design, is a problem solving strategy in which the state of the design problem and the environment in which that problem exists causes change in the goals and activities of the designers (Khushalani, Smith et al. 1994, p.18). These changes may include re-ordering or omitting previously identified activities, or including new activities (Khushalani, Smith et al. 1994, p.18).

Formal approaches to design typically include a hierarchically organised plan, structured in a top-down way (Adelson and Soloway 1985). However, this plan does not necessarily reflect what designers do in practice. Several studies (Guindon 1990; Hayes-Roth and Hayes-Roth 1979; Visser 1990, p.250) suggest that designers adopt new, or modify their existing, problem solving approaches as a result of the state of the problem and that of the environment.

Models of opportunistic behaviour suggest that the plan is followed whilst the designer perceives there to be "…no more opportune actions" available (Visser 1990, p.268).

In situations where deviations from the plan are observed, such deviations do not follow another plan, at least not a conscious one or one which is formally documented (Visser 1990, p.267). Rather, deviations of this sort are opportunistic in nature.

As improvisation includes elements of opportunism, opportunism itself is not considered as an all-encompassing model with which to view ISDM tailoring, but rather as a model that can be accommodated within the notion of improvisation.

2.5.2.4 Improvisation

Improvisation is an approach to the implementation of change which "…stresses the importance of adapting while acting: the ability to think while doing, rather than just following plans" (Weick 1998). There is thus a convergence between the conception and execution of the response (Vendelø 2009). Improvisation deals with the unforeseen, the opposite of contingent approaches that deal only with the foreseen or assumed.

Improvisation does not mean that "anything goes" (Vera and Crossan 2005, p.204). Rather, improvisation draws on creativity and innovation (Carroll and Swatman 1998), and leverages the intuition, competence and experience of the practitioners involved (Ciborra 1999). Weick quotes jazz legend Charles Mingus as saying "…you can't improvise on nothing: you've gotta improvise on something" (Weick 1998, p. 546). Having a significant amount of experience in a particular domain enhances the quality of improvisation, as the broader the range of skills available upon which to draw, the greater the opportunities for alternatives to be identified (Vera and Crossan 2005, p.206). Similarly, Suscheck and Ford (2009) comment that "…improvisation is an *unconscious process* based on expertise and experience". They go on to comment that it "…requires more than spontaneous, intuitive creation; it involves using what exists, and modifying it on the spot and in that moment – adding new ideas and mixing in ideas that have been experienced before".

This combining of skills, experience and context, means that improvisation occurs in a spontaneous and intuitive way (Ciborra 1999), to rework existing material in relation to the context of the project.

This dependence on the skills (Crossan 1998) and experience of people means that improvisation is neither inherently good nor bad, may either result in highly innovative and successful outcomes, or may produce a chaotic situation with the potential to make the development situation more complex and fraught (Vera and Crossan 2004; Vera and Crossan 2005, p.204).

Amongst the key components of improvisation according to Ciborra (1999, p.80) are:

- Situatedness – change is driven by having learned from, and adapted to, the circumstances of the project, rather than trying to control those circumstances.

- Immediacy – there is no time for extended planning. The need for a response is immediate.

- Local Knowledge – local knowledge is important as it provides the context which is key to improvising appropriately. As Ciborra (1996) puts it, improvisation is embedded into the environment where it takes place.

This suggests that the improvised response to the same change in project circumstances may vary significantly, depending on the context, as improvisation allows the approach to be finely tuned to the specific circumstances in place (Ciborra 1999).

Whilst improvisation stresses innovation and creativity, the leveraging of experience means that there is a reliance on established rules and routines (Vera and Crossan 2005, p.203) and on "…traditional skills in a particular domain" (Crossan 1998).

Comparisons are often made in the literature between jazz and theatrical improvisation, where those undertaking the improvisation need to be highly skilled and experienced in order to be able to improvise effectively (Crossan 1998; Cunha, Cunha et al. 1999; Lewin 1998), and who use established rules and techniques documented in the ISDM (Vera and Crossan 2005, p.587) and leverage the experience and opportunism, flexibility, and adaptability of the practitioner to tailor the ISDM to suit the characteristics of the situation at the moment of action. Such tailoring is a reactive, point-in-time form of tailoring rather than it being planned ahead based on known or anticipated conditions.

Improvisation is not only focused on the individual. Team improvisation is more than the sum of individual improvisations (Vera and Crossan 2005, p.204) but is influenced by the same factors as individual improvisation. However, additional factors may also play a part, including team cohesiveness, communication within the team and team culture (Vera and Crossan 2005, p.204).

Improvisation includes elements of opportunism. Opportunistic behaviour was defined in Section 2.5.2.3 as a response to changes in the state of the design problem and the environment which causes change in the goals and activities of the designers (Khushalani, Smith et al. 1994, p.18), and where such changes are not systematic in nature – that is, they depend on the data available at the time. These are features of elements of improvisation.

As situations often arise on an IS development project where circumstances change, resulting in a need for tailoring of the ISDM, the adoption of an improvised approach to tailoring of the ISDM may be a more appropriate response to such changes than other alternatives. Such an approach would draw heavily on the knowledge, skills and experience of the practitioners involved, and their understanding of the context at that point in time, to make effective tailoring decisions.

A clear contrast exists between a contingency approach and one which leverages improvisation. Improvisation stresses the application of innovation, creativity and the leveraging of experience and skill to adapt or tailor existing methods, routines and rules to suit the changing circumstances of a project, as those changes become known. A contingency approach to ISDM tailoring on the other hand responds to known changes, perceived or otherwise, by planning a response to those changes and before the need to act occurs.

2.5.3 Selection of Models

The previous sections have identified and described a number of models applicable to ISDM tailoring. In this section, the relative merits of each will be briefly discussed, and those to be carried forward in this study will be selected.

From the perspective of pro-active models of ISDM tailoring, a contingency based model is the only one identified. The selection and initial tailoring of an ISDM occurs at the commencement of an IS development project, where such decisions are based on known or assumed information about the project's conditions (similar to what Orlikowski and Hofman (1997) refer to as "anticipated changes"). However, as new information emerges during an IS development project, more planning is undertaken, which can potentially lead to additional pro-active tailoring of an ISDM (Carroll 2003).

With respect to reactive models of ISDM tailoring, four were identified and described in Section 2.5.2, those being appropriation, situated action, opportunism, and improvisation. Of these potential models for explaining reactive tailoring of ISDMs, improvisation is seen as the most suitable, as it can be argued that it subsumes the key elements of appropriation, situated action and opportunism.

2.6 Chapter Summary

This chapter has explored a variety of meanings associated with the term "Information Systems Development Methodology (ISDM)" (Section 2.2), and has presented a definition of the term which will be used throughout this thesis (Section 2.2.4). It has explored the motivations behind the use of ISDMs (Section 2.3), and provided an overview of existing studies of the use of ISDMs in practice (Section 2.4). In addition, the shortcomings of existing research into the tailoring of ISDMs have been noted (Section 2.4.7).

This chapter has also identified a number of potential models for describing ISDM tailoring including specifically contingency, appropriation, situated action, opportunism and improvisation (Sections 2.5.1 and 2.5.2). Their suitability for potential inclusion in a validated model of ISDM tailoring has been discussed.

As such, the foundation of the research to be reported has been established.

3 RESEARCH STRATEGY AND DESIGN

3.1 Introduction

In Chapter 1 the aim, significance and motivation for this program of research were presented. Chapter 2 then presented an overview of key literature in the field of ISDMs, including defining the use of the term "ISDM", and identified motivations for their use and tailoring, and described the present theory base and limitations of existing studies.

This chapter describes and justifies the design of the program of research reported in this thesis. It is structured as follows. The research questions are revisited (Section 3.2). A review of various aspects of Information Systems research is provided (Section 3.3). A range of qualitative research strategies available for the conduct of Information Systems Research is discussed (Section 3.4). A strategy suitable to a program of research that addresses the research questions that have been discussed in Section 3.2 is identified and justified (Section 3.4.3). Section 3.5 then introduces a range of qualitative data collection and analysis methods available for use in a study of this type. Finally, the design of the present research, including the research methods selected, with a focus on the structured-case strategy, is described and justified in detail (Section 3.6).

3.2 Research Questions

In Section 1.4**,** the overarching question was presented as

Why are technologies in use different to technologies as designed?

In addition, two specific research questions were presented:

1. What are the components of a model of ISDM tailoring that can be synthesised from the literature, expert opinion and available theoretical foundations?
2. To what extent does the synthesised model of ISDM tailoring reflect contemporary practice of ISDM tailoring as conducted in large, commercial projects?

These research questions explore perceptions that the tailoring of an ISDM that is being applied in complex, commercial projects is under-represented in the extant literature and consequently poorly understood (Backlund 2002; Curtis 1980; Curtis 1986; Sjøberg, Hannay et al. 2005) and accommodates observed ISDM tailoring practice in large, complex commercial practice.

3.3 Information Systems Research

The types of research question being investigated constrain the choice of research strategy to be employed (Yin 2003).

The selection of a research approach is driven by a number of influences, including whether the research question:

i. is best addressed through the use of qualitative or quantitative research methods; and
ii. implies that the investigation is exploratory, descriptive or explanatory in nature (Neuman 2003).

These considerations raise issues related to rigour, relevance and the type of theoretical insight being sought. The sections which follow provide an overview of the key features of quantitative and qualitative research, the perceived tension between the rigour and relevance of research, and types of theory, so providing a foundation for selection of the research strategy to be employed.

3.3.1 Quantitative and Qualitative Research

When considering approaches to research, the terms "quantitative" and "qualitative" are typically used to refer to the **types** of data collected, and to the **methods of analysis** to which the collected data should be subjected.

Quantitative data refers to data in the form of numbers, which are analysed using statistical techniques, or other forms of numerical analysis (Miles and Huberman 1994).

Qualitative data, on the other hand, are non-numeric, and are captured in the form of text, words or pictures that cannot be subjected readily to numerical forms of analysis (Denzin, Lincoln et al. 2000).

Qualitative data are typically captured through the use of methods including observation, interviewing, and the collection of artefacts (e.g. words, text or pictures). These are typically analysed using methods involving textual analysis (Ponterotto 2005), rather than methods appropriate to quantitative data involving quantification or statistical analysis (Denzin, Lincoln et al. 2000).

The tailoring of an ISDM is an activity which requires interaction between a number of participants, including the ISDM Tailoring Practitioner, Project Managers, and Architects and Testers, and as such it is social in nature. Investigating the social nature of the ISDM tailoring activity suggests the selection of a research strategy that employs qualitative methods for the collection and analysis of data. This choice provides a means for investigating, in-depth, participants' perceptions of the nature and rationale for ISDM tailoring (Walsham 1995).

3.3.2 Relevance and Rigour

This section briefly reflects on the debate within the IS community concerning factors that contribute to the relevance and rigour of IS research.

Research is relevant when it addresses the needs of one or more stakeholders (Rosemann and Vessey 2008) or when the research produces knowledge that addresses enduring and/or current organisational problems in a manner that IS professionals can apply in their daily work (Benbasat and Zmud 1999).

Within some parts of the IS community there is a perception that relevance and rigour may be mutually exclusive (Davenport and Markus 1999) - specifically, it is possible for research to be undertaken rigourously but yet to lack relevance and that being relevant might preclude the exercise of academic rigour. Rosemann and Vessey (2008), however, provide insights into how research may be both relevant to practice and academically rigourous.

3.3.2.1 Relevance

When assessing the relevance of research, Rosemann and Vessey (2008) draw on Klein, Jiang et al.'s (2006) three dimensions of relevance: importance, accessibility, and applicability. The relevance of the research presented in this study will be compared against these criteria:

- Importance - Research is ***important*** when it addresses a real world problem in such a way that it can act as the starting point for providing an eventual solution;
- Accessibility - Research is ***accessible*** when the research is understandable, readable, and focuses on results rather than the research process; and
- Applicability - Research is ***applicable*** when the published article or report is complete, if it provides guidance and/or direction, and if it provides concrete recommendations for practice (Klein, Jiang et al. 2006).

In considering the relevance of the research described within this thesis, the existing state of research into the use of ISDMs is considered first. Whilst the manner in which ISDMs are applied and tailored has been the subject of a significant body of existing research, that research has perceived shortcomings (see Section 2.4.7). Specifically, it has been noted that the existing research has largely used students as the subject of study rather than experienced practitioners (Maiden and Sutcliffe 1992); the focus of the application of the methodology has been on sample, rather than real problems (Guindon 1990); and the studies have been performed in a laboratory rather than in the practitioner's usual working environment (Carroll and Swatman 1998; Wynekoop and Russo 1997). This has led to calls for further research on how methodologies are actually used (Aydin, Harmesen et al. 2005).

This program of research addresses these perceived shortcomings in that it examines ISDM tailoring:

- planned and executed by experienced practitioners;
- on several large, complex, commercial Information Systems projects; and
- collects data in the practitioner's workplace.

Using Klein, Jiang et al.'s (2006) criteria the research is relevant therefore, because it is:

- Important

  The research presented addresses the real world problem of the tailoring of ISDMs in large, complex, commercial Information Systems projects. In doing so, a conceptual model is developed to represent ISDM tailoring which acts as the starting point for additional research and for providing guidance to practitioners when tailoring an ISDM.

- Accessible

  In order to meet academic requirements, the research is presented in this thesis supported by a detailed, understandable description of the research process. Further, the research outcomes are expressed in a form that focuses on observed industry practice, and the implications for practice.

- Applicable

  The research provides insights into ways in which the understanding of ISDMs may be modified to produce improved outcomes. In addition, insights specific to the organisation under study on how their suite of ISDMs, and the accompanying approach to methodology training, may be developed, are also provided.

3.3.2.2 Rigour

Rigour in the design and execution of research is essential to ensure that the research meets the quality standards demanded of an academic discipline (Rosemann and Vessey 2008). Within academia, the rigour with which research is conducted establishes the credibility of the research, provides opportunities for the research to be published in quality journals and enables competition for research funding (Applegate and King 1999; Dennis, Valacich et al. 2006; Robey and Markus 1998).

Rigour in research is typically established through the application of a sound research methodology (Benbasat and Weber 1996). Rigour in the conduct of the study described within this thesis is provided by:

- Identifying and adopting an appropriate research strategy to guide the research;
- Identifying suitable types of data to be collected and methods of analysis to apply to the collected data;
- Drawing on multiple sources of data when examining phenomena of interest in order to triangulate to improve the reliability of the findings; and
- Cross referencing results during analysis – for example, when coding interview transcripts, having the output of the coding exercise checked by a supervisor(s) in order to confirm the soundness of the schema used and its application.

Each of the points outlined above are discussed in detail in subsequent sections of this chapter as the design of the research is described.

3.3.3 Theory

The process of conducting research to construct underlying theoretical insights can be conceptualised in a number of ways. In this section, four of these conceptualisations are discussed briefly.

In the first, the building and testing of theory can be approached from two perspectives (Neuman 2003, p.50). One potential starting point can be the development of an "abstract, logical relationship among constructs" moving then towards concrete empirical evidence to develop and test the theory. This is referred to as a *deductive* approach (Neuman 2003, p.51). An alternative is to begin with the collection of empirical evidence and then, on the basis of that evidence, to move towards the development and testing of theory. This is termed an *inductive* approach (Neuman 2003, p.51) and commonly draws upon the use of qualitative research methods in the design of the research. In practice, the application of either approach in isolation is rare, with studies often employing both.

In the second conceptualisation, the research process can be viewed as consisting of three phases (theory building, theory testing, and theory extension), with the *purposes* of research accordingly being defined as the building of theory, the testing of theory and the refinement of theory (Galliers 1991, p.341).

In a third conceptualisation, theory development aims are classified as being one or more of exploration, description or explanation (Neuman 2003). Whilst research may have features of multiple goals, one is typically dominant within a study.

Exploratory research investigates a poorly understood topic, with the intent of determining the feasibility of conducting research into the topic of interest; formulating more precise questions to be addressed in future research; and to generate new ideas or hypotheses (Neuman 2003, p.29).

Descriptive research is similar to exploratory research, however, whereas the topic of interest is typically poorly understood when conducting exploratory research, a greater level of detail of the phenomenon is understood when undertaking descriptive research. Descriptive research focuses on documenting how aspects of the phenomenon are at a point in time, rather than on explaining why the phenomenon occurs (Neuman 2003, p.30).

Exploratory and descriptive research are similar in many ways, with the distinction between them becoming blurred in practice. The differences centre on the level of detail of understanding contained within each type of research. Exploratory research tends to centre on the investigation and definition of a poorly understood topic, whereas descriptive research provides a more detailed picture of the topic.

Finally, *explanatory* research is concerned with explaining why things are the way they are, and builds on exploratory and descriptive research. It does this either by proposing reasons for observations, or by evaluating existing explanations for observations (Neuman 2003, p.30).

The final of the conceptualisations of underlying theoretical insights is that of Gregor (2006), which focuses on the goals of research. She proposes a taxonomy of theory types, consisting of:

- Theory for analysis – theories of this type provide a description of the phenomena of interest, including an analysis of relationships among those constructs, however, no attempt is made at specifying causal relationships nor in making predictions (Gregor 2006, p.619-620);

- Theory for explaining – theories of this type explain how, why, and when things happened. Such an explanation is usually intended to promote greater understanding or insights by others into the phenomena of interest (Gregor 2006, p.620);
- Theory for predicting – this type of theory provides "predictions and testable propositions but does not have well-developed causal explanations" (Gregor 2006, p.620);
- Theory for explaining and predicting – these theories are more comprehensive, in that they describe the phenomenon of interest (the how, why, when, and where things happened), and make predictions (i.e. they say what will be); and
- Theory for designing and acting – the final category of theory within Gregor's taxonomy, theories of this type explain how to do something by providing "explicit prescriptions (e.g., methods, techniques, principles of form and function) for constructing an artefact" (Gregor 2006, p.620).

In terms of the deductive/inductive classification of the role evidence plays in theory development, this thesis employs aspects of both deductive and inductive approaches. Initially, a synthesis of present understandings of ISDM tailoring is proposed, to be tested against empirical evidence (essentially a deductive approach). As empirical evidence accrues, however, the research remains open to theoretical extension (an inductive approach).

In terms of research phases, existing investigations of ISDM tailoring have shortcomings (see Section 2.4.7). As a consequence, the research described in this thesis should be classified as *theory building* (1991, p.341), as it seeks to generate new knowledge about ISDM tailoring in large, commercial projects. However, as the intent described in Section 2.5.3 was to build theory by starting with an existing model of ISDM tailoring and refining and extending it, the present study may be viewed as including aspects of *theory extension*.

In regard to the aims of research, the research described in this thesis could be classified as *exploratory*, in that it seeks to generate new knowledge. In the paragraph above, however, it was argued that the intent of the study was to build theory by starting with an existing model of ISDM tailoring and extending it. As such, the present study may be viewed as *descriptive* research.

Finally, viewing the study through the lens of Gregor's (2006) taxonomy, the outcomes of the study may be classified as *theory for analysis*. Description of the phenomena of interest, including an analysis of relationships among constructs, is a key aim of the study. However, given that the purpose of the study is to expand on an existing theory, and therefore to promote greater understanding of the phenomenon of interest, the study embraces some aspects of *theory for explaining*.

3.4 Selection of a Research Strategy

3.4.1 Candidate Research Strategies

The preceding sections have discussed the research questions and objectives (Section 3.2) and argued in support of qualitative data capture and analysis methods (Section 3.3.1). The demand for both relevance and rigour has been explored (Section 3.3.2) and the nature of the theoretical insights that are being sought has been considered (Section 3.3.3). Consistent with these considerations, various potential candidate research strategies that employ qualitative research methods are now reviewed, so introducing possible strategy options.

Three candidate research strategies are presented in the sections which follow: Case Studies, Action Research and Ethnography. These approaches were selected, and others (such as field experiments and surveys) excluded from consideration, because, as noted in Section 3.3.1, tailoring of an ISDM is a social activity supporting the selection of a research strategy that employs qualitative methods.

3.4.1.1 Case Studies

Case studies focus in-depth on a small number of events or organisations, and so are able to capture "reality" in greater detail than other research approaches (Galliers 1991). They enable observation of phenomena within their organisational setting (Silverman 1998, p.3), thus facilitating building theory from practice (Benbasat, Goldstein et al. 1987, p.370). However, this in-depth focus comes at a price – the restriction to a small number of organisations limits generalisability (Baskerville and Wood-Harper 1996; Strauss and Corbin 1998). Further differences inherent in the approach include an inability to control variables, the likelihood that different interpretations of the same events may be made by different observers (Galliers 1991), and that whilst relationships between variables may be identified, the direction of causation cannot always be established (Cavaye 1996).

Yin (2003) states that a variety of data collection techniques should be employed in case studies, and advocates the use of interviews, observation, and document analysis. The application of a variety of such techniques avoids a criticism which has been directed towards research using case studies, that they have focused on the use of "open-ended interview" techniques (Silverman 1998, p.3).

3.4.1.2 Action Research

Action Research can be defined as a "set of self-consciously collaborative and democratic strategies for generating knowledge and designing action in which trained experts in social and other forms of research and local stakeholders work together" (Greenwood and Levin 2011, p.29). Action Research approaches engagement with the stakeholders differently to other forms of research, as it centres "… on doing 'with' rather than doing 'for' stakeholders and credits local stakeholders with the richness of experiences and reflective possibilities that long experience living in complex situations brings with it." (Greenwood and Levin 2011, p.29).

Action Research utilises data collection techniques similar to those employed in case studies, but is significantly different in regard to the role played by the researcher. In case studies, the researcher does not intentionally intervene to change the nature of a problem situation. However, in action research, the researcher enters the field with the intention of interacting with the host organisation to produce outcomes of benefit to the organisation (Baskerville and Wood-Harper 1996; Susman and Evered 1978), whilst simultaneously contributing to theory (Owen and Linger 2011, p.4).

This study aims to develop an understanding of the phenomenon of ISDM tailoring. Whilst the study may generate recommendations to the organisation under study, the implementation of such changes is not considered within the scope of the study. For that reason, action research was not considered suitable as a research strategy.

3.4.1.3 Ethnography

Ethnography is a research strategy which involves describing "a culture and understanding another way of life from the native point of view" (Neuman 2003, p.366). Ethnography assumes that much of the intent of people lies beyond what is seen or said and is, in fact, implied through culture, and behaviour in specific contexts (Garfinkel 1967). Such implied knowledge is encoded in symbols, songs, sayings, facts, ways of behaving and objects such as newspapers.

The emphasis on understanding a way of life from the participants' point of view requires the researcher to be deeply immersed in the context of the phenomenon of interest over an extended period of time (Cavaye 1996). Researchers aim to enter the research site without pre-conceived theoretical constructs and make no assumptions about the reality or otherwise of the collected data (Cavaye 1996). Instead, collected data is interpreted from the viewpoint of the participants of the phenomenon (Cavaye 1996).

Key to the application of an ethnographic approach is the development of thick descriptions (Garfinkel 1967) of phenomena – a rich, detailed description of the specifics of the phenomenon allowing multiple potential interpretations of the phenomenon and which captures the context in which the phenomenon is situated.

Ethnographic research requires the researcher to take on two roles: they must be sufficiently immersed within the context of the phenomenon of interest to be able to understand the perspective of the participants, whilst remaining sufficiently detached from it to retain an ability to critically review events.

A significant issue with the use of ethnography as a research strategy is that such an approach requires very lengthy periods of time in the field – some proponents advocate periods of at least a year. However, instances of ISDM tailoring tended to be very brief. Spending large periods of time in the field in the hope that the occasional, fleeting instances of ISDM tailoring which did occur would be observed, was deemed to be an inefficient research strategy. For this reason, a purely ethnographic strategy was not employed.

3.4.2 The Chosen Research Strategy - Structured-Case

This section of the thesis describes the selected research strategy, structured-case, which is built upon the notion of the Case Study (see Section 3.4.1.1), and which provides guidelines for conducting sound case-based research. This section provides a justification for its selection, and an explanation of how the strategy is applied in the development of a model of ISDM tailoring.

The development of theory from qualitative data is a highly iterative process (Carroll and Swatman 2000, p.236; Eisenhardt and Graegner 2007) requiring a research approach which supports iteration. Furthermore, the phenomenon of interest, the tailoring of an ISDM in large, commercial projects, is social in nature, in that it is concerned with the complex interactions of people, processes and technologies which occur within the case organisation. This lends itself to an intensive approach (Vigden and Braa 1997) applying a variety of qualitative data collection and analysis techniques. Structured-case (Carroll and Swatman 2000) was identified as a suitable research strategy in this context because:

- It supports the use of case based research, allowing for understanding of the context of the phenomenon;
- It has in-built iteration; and
- It brings rigour and traceability to the process of theory-building.

Structured-case is s*tructured* in the sense that it incorporates a formal process model to guide researchers through the collection, analysis and interpretation of often large volumes of data, and uses the concept of a *case* in the broad sense of the phenomenon being studied (Carroll and Swatman 2000, p.236).

The IS literature is replete with examples of criteria for conducting rigorous research using case studies employing both positivist (Benbasat, Goldstein et al. 1987; Lee 1989) and interpretivist paradigms (Walsham 1995). Whilst this literature is useful in providing some guidance on what is needed for rigorous IS research using case studies, the criteria reported could be critiqued as providing little explicit executable guidance on how to achieve this.

Eisenhardt (1989) reports an eight step roadmap to guide development of theory from case studies, but this roadmap does not adequately describe the process for inducing theory from data. It represents the process of theory development as linear, rather than portraying it as an inherently iterative and recursive process (Carroll and Swatman 2000, p.236).

3.4.2.1 Structured-Case

Structured-case can be understood in terms of three key elements:

- The Conceptual Framework;
- The Iterative Research Cycle; and
- The Literature-based Scrutiny of Theory Constructed.

These three elements are interrelated as depicted in Figure 7, and constitute a cohesive strategy for the execution of a program of case based, qualitative research.

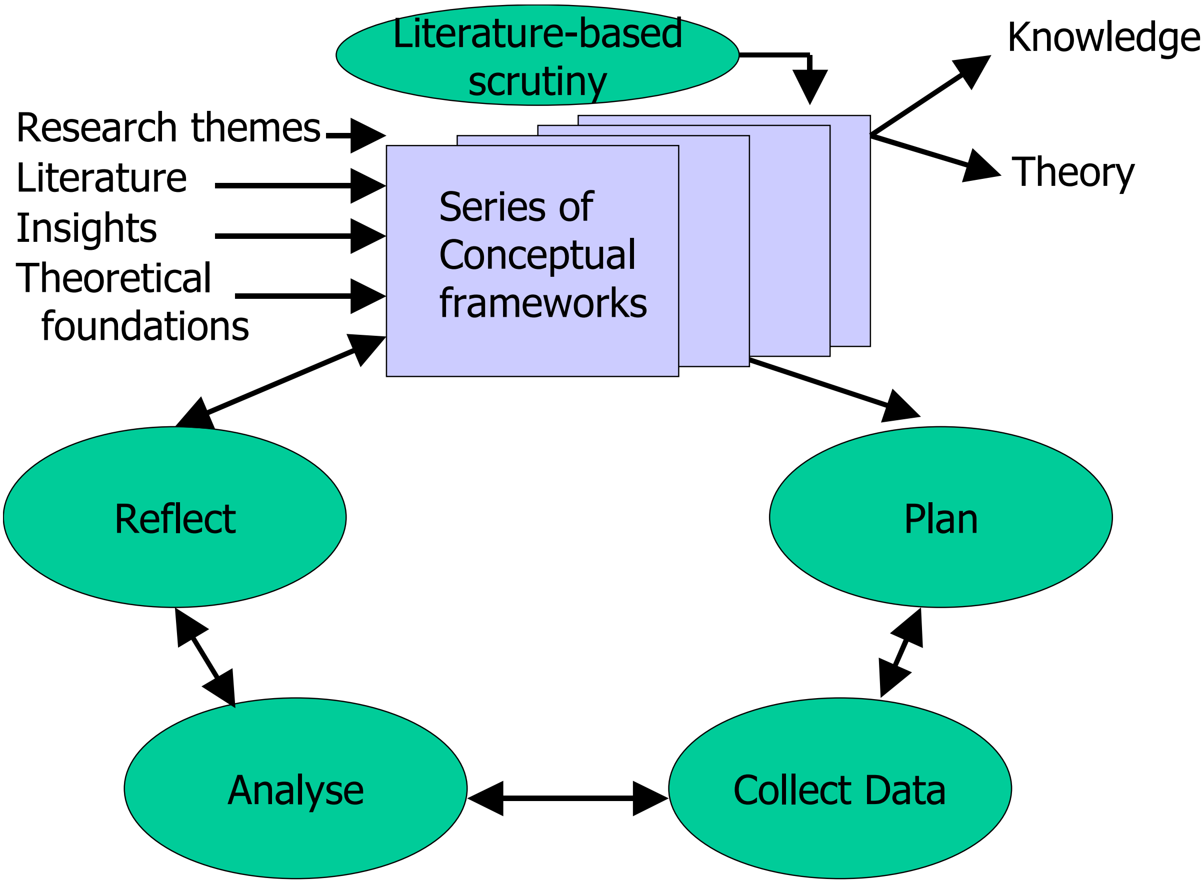

Figure 7 - Structured-Case Research Method (Carroll and Swatman 2000)

Each of these three elements is discussed in the sections which follow.

The Conceptual Framework

The question of how much conceptual structure should be in place at the commencement of a qualitative research project to guide it has been the subject of much discussion within the literature (Eisenhardt 1989; Miles and Huberman 1994; Strauss and Corbin 1998). Two positions have been identified:

- The "Effectiveness" Position – where the requirement is for the researcher to be as attuned as possible to concepts which are contained within the data, **effectiveness** of the research is the key consideration. A research design with very little pre-defined structure is the means to achieve this. Such a research design ensures that pre-conceived ideas and biases are minimised and that there is maximum sensitivity to concepts which emerge from the data (Carroll and Swatman 2000); and
- The "Efficiency" Position – where research resources are limited, **efficiency** in the conduct of the research and use of research resources becomes key. A research design

which includes a pre-defined conceptual structure to provide focus to the research and to maximise the efficient use of research resources should be employed.

In practice, however, rather than adopting one or other of these positions, researchers conducting qualitative research most often seek a balanced position between these two extremes (Marshall and Rossman 1999, p.105).

All researchers bring to their studies a conceptual lens or view of the phenomenon of interest which is the result of a mixture of beliefs, their prior experiences and acquired knowledge, assumptions about the world, and ideas about what knowledge is and how it is obtained. Much of this conceptual lens may be implicit. The result of this mixture of influences is that collected data are both theory-laden and value-laden (Guba and Lincoln 1994). A formally documented conceptual structure which makes these influences explicit is critical to the execution of high quality qualitative research.

Within the structured-case framework, this formally documented conceptual structure is called the "theoretical foundations", and it forms one of the key inputs to the conceptual framework (CF). The purpose of the CF is to explain "either graphically or in narrative form, the main things to be studied – the key factors, constructs or variables – and the presumed relationships between them" (Miles and Huberman 1994, p. 18) and expresses the current state of knowledge or understanding.

The Initial Conceptual Framework, to be used at the start of a program of theory-building, is shaped by four influences (highlighted in Figure 7):

- Research themes – The research themes set the areas of research interest. Inductive, qualitative research often begins with broad research themes or questions that are refined throughout the research process (Carroll and Swatman 2000, p.237).
- Literature – Literature informs the research by identifying the current understanding of the phenomenon of interest as well as highlighting gaps which may provide opportunities for subsequent investigation (Carroll and Swatman 2000, p.237).
- Insights – Insights (or "expert opinion") into the state of the phenomenon of interest from the perspective of experts (including practitioners) may inform the study and help to shape the emerging Conceptual Framework (Carroll and Swatman 2000, p.237).

- Theoretical foundations - All researchers bring to their studies a conceptual lens shaped by a mixture of beliefs, prior experiences and acquired knowledge, assumptions about the world, and ideas about what knowledge is and how it is obtained.

The other inputs into the Initial Conceptual Framework which have been described above are filtered by these theoretical foundations (Carroll and Swatman 2000, p.237).

Figure 8 represents the inputs to the Initial Conceptual Framework diagrammatically.

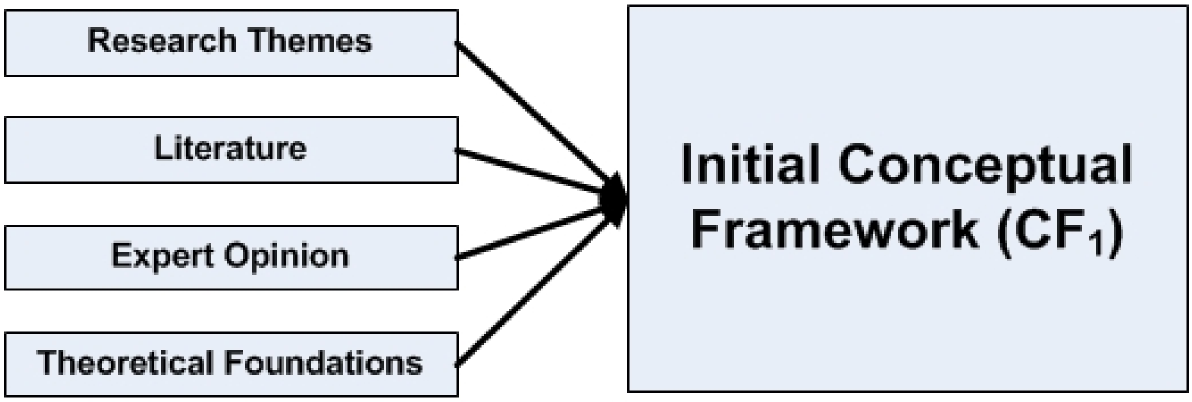

Figure 8 - Inputs to the Initial Conceptual Framework (Carroll and Swatman 2000)

Once the Initial Conceptual Framework is developed, it serves as input to the first of a series of cycles of research, as described below.

The Iterative Research Cycle – Structure of Each Cycle

The aim of each cycle of research is to increase understanding of the research themes leading to change or refinement of the Conceptual Framework in order that it reflects observed practice.

The cycles of research contain, within them, iteration at two levels, as represented in Figure 9. Firstly, there is the iteration provided by the multiple cycles of research. Secondly, each research cycle itself has iteration built into its form, which is conceptualised as involving four stages, each of which is described below. Note that while the stages are presented as discrete, in practice, they are ill-defined with substantial iteration between adjacent stages (Carroll and Swatman 2000, p.238), and can even be viewed as components of one activity (Marshall and Rossman 1999). Hence, it is not possible to describe a single linear path through the research cycle.

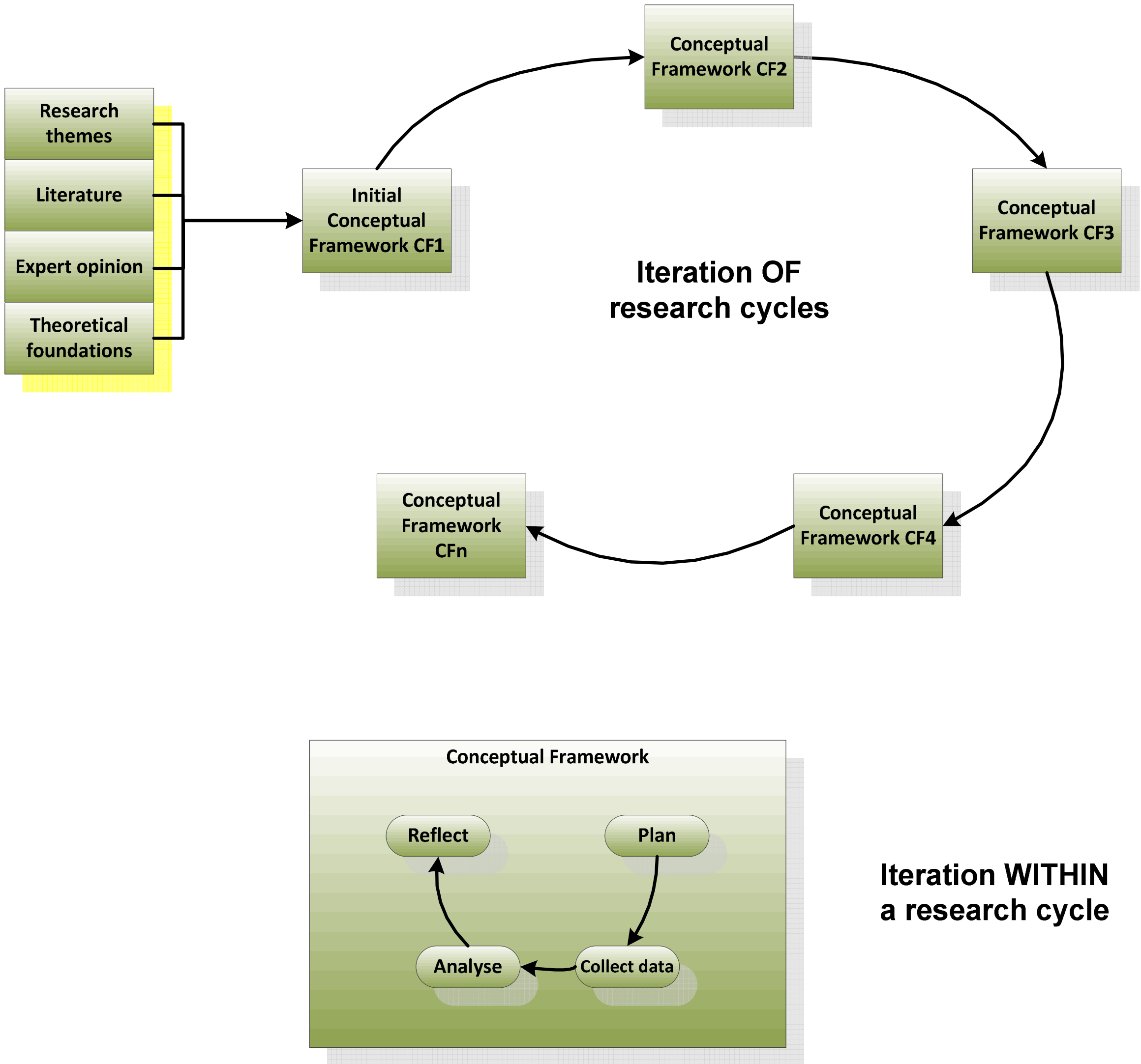

Figure 9 - Two Levels of Iteration within Structured-Case

Plan

The "Plan" stage involves the development of a research design based on a requirement to extend the Initial Conceptual Framework. Issues to be considered include deciding what data are relevant, what data should be collected, what methods to employ to collect the data, and how to analyse the collected data (Yin 2003).

Integral to the planning of data collection is the need to identify appropriate cases and organisations, and the means of gaining access to them.

Collect Data

Data collection and recording is guided, at least initially, by the plan outlined in the preceding element of the Research Cycle. Consistent with the statement earlier that "while the descriptions of the stages are discrete, in practice, they are ill-defined, with much iteration between adjacent stages", data collection and analysis may in fact be conducted simultaneously, with collection of additional data taking place whilst analysis of recently collected data occurs. This may result in changes to the putative design (including to instruments for data collection and analysis), as new opportunities for exploration emerge from the analysis.

Analyse

Analysis is not a one-off activity but rather is iterative. For example, the reading and re-reading of transcripts and other forms of collected data in order to develop a deep level of understanding is a characteristic of qualitative research.

The iterative nature of analysis has been expressed by Carroll and Swatman (2000) who describe the relationship between the emerging understanding of the data as encapsulated in the Conceptual Framework, and the subsequent analysis of the data – "the researcher's initial understanding guides analysis of the data which in turn leads to new understanding which guides further reading of the data and leads to new understanding" (Carroll and Swatman 2000, p.238).

C*oding* is a key technique used in qualitative research (Denzin, Lincoln et al. 2000; Strauss and Corbin 1998). Coding is the process by which the concepts encapsulated in the Conceptual Framework are used to undertake analysis, and which link the data, the data analysis and the research themes encapsulated in the Conceptual Framework. Additional concepts which emerge in the course of coding are then inputs to the refinement of the Conceptual Framework (which occurs during the Reflect stage).

Reflect

Structured-case incorporates a period of deliberate reflection, analysis, and interpretation of the data which have been collected in a cycle of research (Carroll and Swatman 2000). This period of conscious reflection is intended to mitigate the tendency to note only evidence in support of emerging interpretations (Babbie 2010).

The reflection stage involves critical examination of tentative findings, observations and scrutiny of outcomes. A key activity at this time is to consider how the emerging findings fit the Conceptual Framework which guided this particular cycle of research. This, in fact, underpins the process of theorising – relating the findings to the outcomes of previous cycles of research, encapsulated within the Conceptual Framework produced at the end of those cycles; revisiting the literature; and looking for patterns and themes in the analysed data, to describe emerging ideas and concepts.

Outcomes from this reflection may include support for the existing Conceptual Framework, or may challenge elements of it, resulting in changes being made to it to incorporate learning acquired in this cycle of research.

The Iterative Research Cycle – Multiple Research Iterations

The development of theory is "creative, intellectual work" (Coffey and Atkinson 1996, p.142). Within the structured-case strategy, theory development comes about as a result of the interplay which occurs between the Conceptual Framework and multiple research cycles (Carroll and Swatman 2000, p.239).

Consideration of the research themes, literature, expert insights and the researcher's theoretical foundations combined with the findings from a Pilot investigation (see Section 3.6.1.1) yields an "Initial" Conceptual Framework CF_1. Each of the Conceptual Frameworks created as an outcome of a research case iteration, informs and extends the framework from the previous cycle of research typically resulting in an incremental increase in the richness and depth of understanding of the phenomenon of interest. However, at some point, the inclusion of additional cycles of research must stop, either due to practical limitations such as the availability of funding or time, or because theoretical saturation (Glaser and Strauss 1967) has been reached, with that point being determined by the researcher.

In summary, each cycle of research generates the next iteration of an evolving Conceptual Framework (CF_1, CF_2, CF_3, …, CF_n etc) resulting in what Carroll and Swatman (2000) term "a spiral towards understanding". The refined Conceptual Frameworks generated within the cycles of research record the process through which theory has been built, and the links to the data collected (Carroll and Swatman 2000, p.239).

Literature-Based Scrutiny of Theory Constructed

The final component of the structured-case research strategy is literature-based scrutiny of the theory that has emerged during each cycle of research (Carroll and Swatman 2000).

The purposes of this comparison with the literature are two-fold:

- To assess the extent of agreement between the findings encapsulated in the Conceptual Framework, and the literature; and

- To assess the extent of conflict between the findings and the literature and to seek an explanation of such conflicts.

At this point in the program of research, the Conceptual Framework, as it exists, is compared with a broad range of existing literature. The outcome from this process is the abstraction of the developed theory to a higher level, with the theory thus being potentially applicable to a broader range of contexts than that in which the study was conducted (Carroll and Swatman 2000).

3.4.3 Justification of the Selection of Structured-Case

Previous sections of this chapter (particularly Section 3.4.1) have identified a number of candidate strategies for guiding the conduct of the investigation of ISDM tailoring, and provided an explanation of why those strategies were considered unsuitable. In this section, a justification for the application of structured-case is provided.

Tailoring an ISDM is an inherently social activity as it involves a variety of participants filling a number of roles, including Project Managers, Developers, Architects and Testers. As a consequence, a research strategy that employs qualitative methods for the collection and analysis of data is suggested to allow for in-depth investigation of participants' perceptions of the nature and rationale of ISDM tailoring (Walsham 1995).

The need for in-depth investigation suggests that a case based approach be selected. Case studies allow for in-depth investigation of a small number of events and as such are able to capture richer detail than many other research approaches (Galliers 1991). Further, the application of a case based approach allows for the observation of the phenomenon of ISDM tailoring within an organisation (Silverman 1998, p.3). Multiple methods of data collection should be employed (Yin 2003), consistent with the need for rigour in research (Section 3.3.2). This in turn facilitates the building of theory from practice (Benbasat, Goldstein et al. 1987, p.370).

It was previously noted that theory development from qualitative data is highly iterative in nature (Carroll and Swatman 2000, p.236; Eisenhardt and Graegner 2007). This introduces one further constraint upon the research strategy to be selected – such a strategy should explicitly support iteration. As such, structured-case (Carroll and Swatman 2000) is an appropriate choice.

3.5 Data Collection and Analysis Methods

Having identified the overall research strategy, this section describes the methods of qualitative data collection and analysis that are employed within the structured-case research cycles.

3.5.1 Qualitative Data Collection Methods

Yin (2003) identifies six potential sources of evidence that can be used when conducting research using a case study approach. The relative strengths and weaknesses of each form of data collection technique are summarised in Table 2.

Table 2 - Relative Strengths and Weaknesses of Data Collection Techniques

Form of data	Strengths	Weaknesses
Interviews	• Targeted – focus directly on case study topic • Insightful – provide insight into perceived causal inferences	• Bias due to poorly constructed questions • Response bias • Inaccuracies due to poor recall • Reflexivity – interviewee gives what interviewer wants to hear
Direct Observation	• Reality – covers events in real time • Contextual – covers context of events	• Time-consuming • Selectivity – unless broad coverage • Reflexivity – event may proceed differently because it is being observed • Cost – hours needed by human observers
Participant Observation	• **[Same as above for direct observation]** • Insightful for interpersonal behaviour and motives	• **[Same as above for direct observation]** • Bias due to investigator's manipulation of events
Document Collection	• Stable - can be reviewed • Unobtrusive – not created as a result of the case study • Exact – contains exact names, references and details of an event • Broad coverage – long span of time, many events, and many settings	• Retrievability – can be low • Biased selectivity, if collection is incomplete • Reporting bias – reflects (unknown) bias of author • Access – may be deliberately blocked

Archival Records Collection	• **[Same as above for documents]** • Precise and quantitative	• **[Same as above for documents]** • Accessibility due to privacy concerns
Physical Artefacts	• Insightful for cultural features • Insightful for technical operations	• Selectivity • Availability

Three data collection methods were selected from those outlined by Yin: interviews, observation and document collection.

Note that for the present study, documents were collected at the time of their generation and hence there were no archival records to collect and analyse. Similarly, there were no physical artefacts generated. Thus whilst the relative strengths and weaknesses of these forms of evidence are documented in Table 2, they are not included in the sections which follow.

(Note: Diagrams etc. created during observed tailoring sessions are considered herein to be examples of documents collected at the time of their generation rather than physical artefacts.)

3.5.1.1 Interviews

A number of techniques for conducting interviews exist, varying in the structure each takes and in the number of individuals involved (Denzin, Lincoln et al. 2000; Yin 2003).

All interview types share a common set of strengths and weaknesses. The ability to target a set of questions to a specific set of interview subjects enables a tight focus on the phenomenon of interest, whilst answers to the questions can give insight into the subject's perception of causal influences (Yin 2003). However, poorly constructed questions can introduce bias, and inaccuracies can arise as a consequence of the limitations of the subject's ability to recall (Yin 2003).

Structured Interviews

In a structured interview, each person interviewed is asked the questions in the same order with the interviewer being required to treat all participants in the same manner (Fontana and Frey 2000).

Whilst structured interviews are a valuable tool for conducting comparative analysis, the constraint of applying a script prepared in advance means that there is no opportunity for improvisation (Myers and Newman 2007) which limits the ability to follow up interesting comments or seek explanatory information. As a consequence, structured interviews are not well-suited to exploratory research.

Semi-Structured Interviews

In a semi-structured interview, the researcher uses an interview guide containing broad questions which explore themes and which form a framework for the conduct of the interview. These questions are often, but not always, put to the participants in the same order. However, whereas a structured interview constrains the respondent's answers to a limited set of categories, in a semi-structured interview there are no pre-defined responses for the respondent to choose from. Instead the interviewee responds to the question by providing descriptions of specific situations.

This allows the researcher to pursue ideas that arise, injecting additional questions to explore the respondents' understanding. As a result, this type of interview potentially leads to a richer exploration of the phenomenon of interest (Fontana and Frey 2000).

In the course of investigating ISDM tailoring, opportunities for conducting interviews with ISDM tailoring participants using semi-structured interview strategies were exploited. These allowed the interviewee to provide rich descriptions of specific situations, while permitting the researcher to inject additional questions to explore respondents' perceptions and understandings.

Unstructured Interviews

With unstructured interviews participants are given an opportunity to tell their story in an unstructured manner, without either guiding questions or constraints as to how they might respond.

Group Interviews

A group interview involves questioning of several individuals simultaneously, either in a formal or informal setting (Fontana and Frey 2000). The manner of executing a group interview may be either structured or unstructured, or, as is often the case, somewhere in-between (Wimmer and Dominick 2002). A key issue with conducting group interviews is that the need to engage and interact with a number of people (6-12 is often mentioned as the size of the group) often results in an interview session which can be very long.

3.5.1.2 Observation (Direct and Participant)

Observation provides an opportunity for the interactions which take place between the various participants to be recorded for subsequent analysis.

Hader and Lindeman (1933) argue that comprehension of an event's meaning “can only be approximately correct when it is a composite of the two points of view, the outside and the inside”.

Yin (2003) distinguishes between two types of observation:

- *Direct* observation – in which the researcher/observer is a passive observer and plays no part in the events being observed; and
- *Participant* observation – in which the researcher/observer is not a passive observer. Instead the observer plays an active role in the events under observation.

In the course of investigating ISDM tailoring, opportunities for observation of sessions in which ISDM tailoring takes place, were exploited, with the researcher playing the role of direct observer, except as noted subsequently in Sections 5.3.1, 6.3.2, and 7.3.1 .

3.5.1.3 Document Collection

The collection and analysis of documents is an important potential source of data when conducting a case based approach using qualitative research methods (Spradley 1979; Yin 2003). Such documents may be useful "…even though they are not always accurate and may not be lacking in bias" (Yin 2003). The most important use of documents according to Yin (2003) is to "…corroborate and augment evidence from other sources."

For example, in the course of preparing for and executing ISDM tailoring workshops, documents included:

- Documents describing the structure of both the untailored and tailored forms of the ISDM;
- Hand-drawn and electronic diagrams displaying the structure and content of the ISDM;
- Hand-written and electronic documents; and
- Electronic mail exchanges between key participants in the tailoring process.

3.5.1.3 Recording Interview and Observational Sessions

To support accurate data collection in the interviews and observations, audio recording, with participant agreement, was carried out. These recordings were subsequently transcribed to facilitate analysis.

In addition, during observation sessions the researcher recorded field notes, comments and events related to the selection of an ISDM and its subsequent tailoring, as well as observations of the physical setting (Neuman 2003, p.381). These notes facilitated the analysis and development of follow-up interview schedules. In addition, at the conclusion of each observed workshop, participants were questioned about issues observed during the workshop, including seeking clarification and/or elaboration.

3.5.2 Qualitative Data Analysis Methods

3.5.2.1 Coding of Transcripts of Interview and Observation Sessions

Analysis of interview and observation session transcripts using coding is a widely used approach, incorporating a number of techniques.

In *open coding*, transcripts are examined to form an understanding of all possible meanings, and to identify concepts, categories, and their associated properties (Miles and Huberman 1994; Strauss and Corbin 1998). A variety of methods can be employed in open coding, including line-by-line analysis and word, sentence or paragraph analysis (Miles and Huberman 1994; Strauss and Corbin 1998).

Axial coding then takes the potentially large number of codes produced as a result of the open coding process and seeks to progress them to a higher level of abstraction by sorting them into categories or groups of codes sharing some conceptual relationship (Miles and Huberman 1994; Strauss and Corbin 1998).

In the present research, audio recordings of interviews with practitioners and of ISDM tailoring sessions were transcribed within 48 hours, and then coded using the initial set of codes referred to in Section 3.6.4.1. Refinement of this initial set of codes then took place as concepts and themes which emerged during analysis of these transcripts were incorporated.

Application of these techniques to the present research is reported subsequently in Section 3.6.4.

3.5.2.2 Document Analysis

Several techniques are available for the analysis of documents (including field notes) and diagrams etc., depending on the type of the document.

Text Documents

One approach to the analysis of such materials avoids following any pre-defined protocol for the execution of the analysis (Peräkylä and Ruusuvuori 2011). Instead, the analyst reads and re-reads the materials, and in doing so, the key themes are identified, as are the "…presuppositions and meanings that constitute the cultural world of which the textual material is a specimen" (Peräkylä and Ruusuvuori 2011). Where the analysis of text is **not** at the core of the research, such an informal method of analysis may be the best choice.

Alternatively, text based documents (including a variety of other hand-written and electronic documents and, in the present research, formal ISDM documentation) can be subjected to a coding process (similar to that described above in Section 3.5.2.1) to identify the key insights within the text.

As text documents were not the primary means of data collection in the present research, they were subjected to the informal method of analysis involving reading and re-reading.

Non-Text Documents

Non-text documents (for example, diagrams) cannot be analysed through the use of a coding method. Instead, in this research, consecutive versions of these documents were examined to identify sequences of changes made to the diagrams generated in each ISDM tailoring event.

3.6 Research Design

In this section, the design of the research is presented and justified. The structure of the research is described, including a justification for the specific methods of data collection and analysis adopted. In addition, the approach to theory building is discussed.

3.6.1 The Structure of the Research

The research described in this thesis is conceptualised as two phases as shown in Figure 10 below. The first phase consists of a Pilot Study (the design of which is described in Section 3.6.1.1 below) which builds theory through the development of an Initial Conceptual Framework. The second phase consists of validating the Initial Conceptual Framework in a series of three case studies examining ISDM tailoring on large, commercial IS projects. The sections which follow describe each phase in detail.

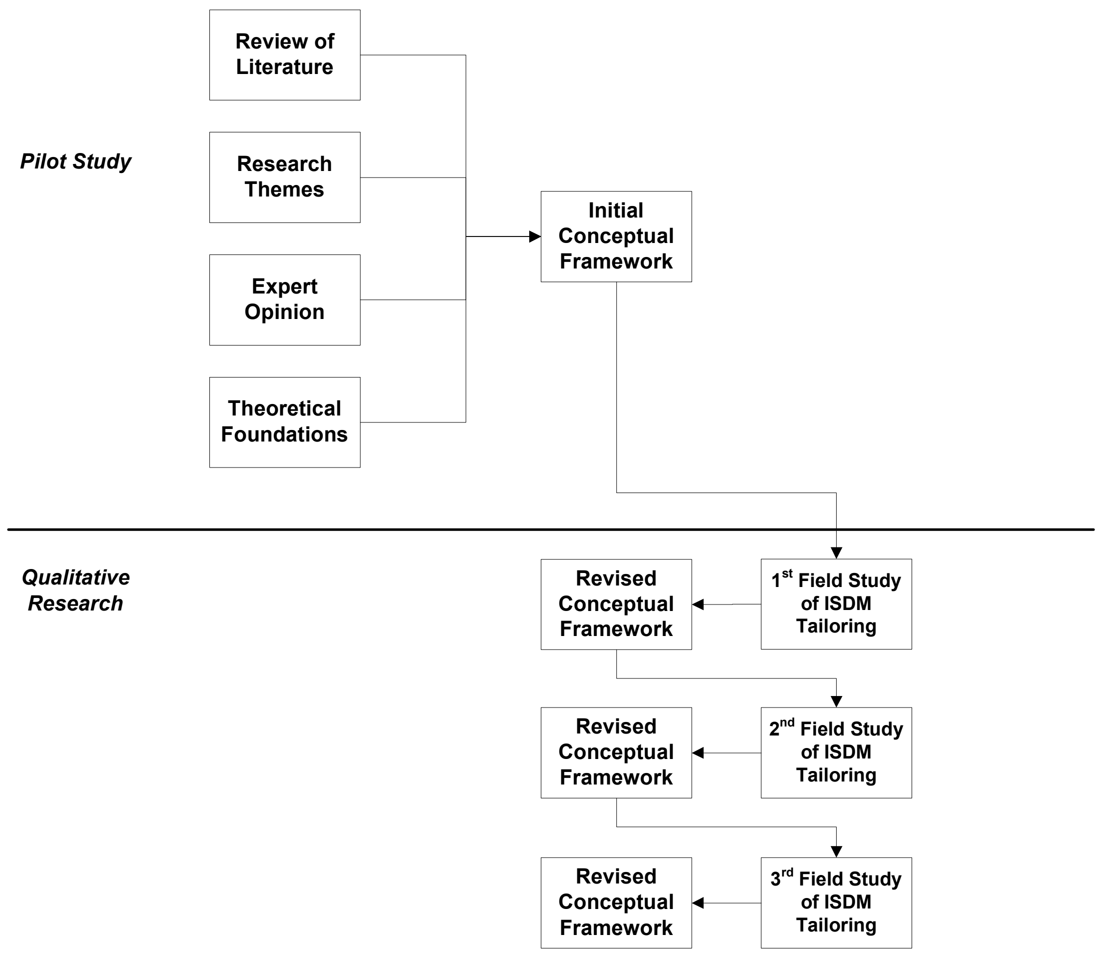

Figure 10 – Structure of the Research

3.6.1.1 Phase 1 – Pilot Study

Chapter 2 provided an overview of the state of understanding of the phenomenon of ISDM tailoring as represented in the literature.

As the examination of ISDM tailoring on large, complex Information Systems projects is under-represented in the literature, a Pilot Study was conducted. According to Yin (2003), pilot studies help to "…refine data collection plans with respect to both the content of the data and the procedures to be followed." Such an approach assists in firming up the area for study, and serves to validate data collection and analysis protocols. The execution of a Pilot Study allowed for the refinement of a key element of the research strategy – the Conceptual Framework.

The Pilot Study, and the construction of the Conceptual Framework (CF_1) which emerged from it, are described in Chapter 4.

A key input to the development of CF_1 is a review of the literature pertaining to ISDM tailoring. The literature informs the development of an awareness of the current state of understanding of ISDM tailoring, and identifies candidate models on which to base a new model of ISDM tailoring.

In Chapter 2, Fitzgerald's (1998b) "Framework for the IS Development Process" was described. In Chapter 4, this framework is extended to incorporate important aspects of ISDM tailoring as observed in workshops conducted in the course of the Pilot Study, and from interviews with selected ISDM tailoring practitioners.

The outcome of the Pilot Study is a synthesised model that represents understanding of the ISDM tailoring process captured in the literature, ISDM tailoring observed in workshops, and from interviews with ISDM tailoring practitioners. It thus includes expert opinion. This synthesised model is expressed graphically (see Section 4.3).

This synthesised model addresses the first research question, *'What are the components of a model of ISDM tailoring that can be synthesised from the literature, expert opinion and available theoretical foundations*?'. The synthesised model provides the starting point for Phase 2, a program of qualitative research.

3.6.1.2 Phase 2 – The Qualitative Research

The qualitative research phase examines ISDM tailoring as it is performed in commercial practice. Three empirical studies are described in Chapters 5, 6, and 7. These studies of commercial instances of ISDM tailoring were undertaken in order to build understanding of the process as it is performed in practice. The outcome from the qualitative research is a validated model of ISDM tailoring.

The development of this model of ISDM tailoring first requires comparison of the synthesised model generated as an outcome of the Pilot Study, with observations of tailoring in practice. This addresses the second research question, which is '*To what extent does the synthesised model of ISDM tailoring reflect contemporary practice of ISDM tailoring as conducted in large, commercial projects?'*.

The relationship between the two phases (Pilot and Qualitative) of the research design, and the subsequent reflection to identify implications, is shown in Figure 11.

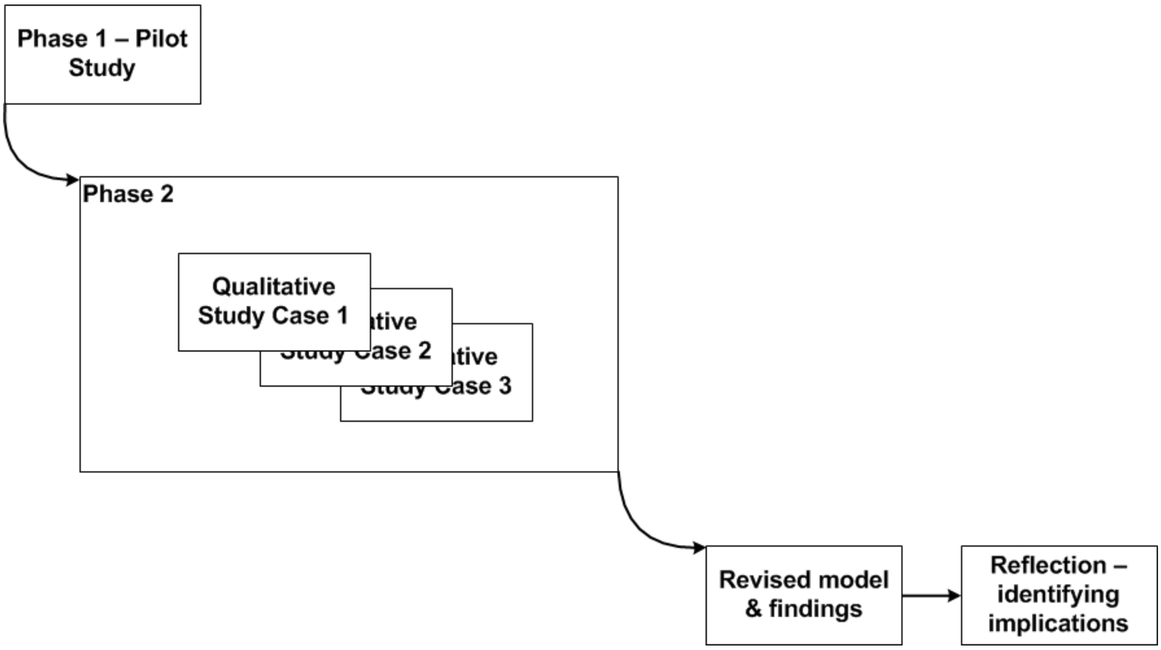

Figure 11 - Components of the Research Design and their Relationship

3.6.1.3 Reflection - Implications

Implications, both theoretical and practical, of the model which emerged from the study were considered through a process of reflection, in which the model was compared with the standard form of the case organisation's ISDM as it is represented in supporting documentation and training materials. Significant areas of similarity and difference between the two representations were identified. Based on the outcomes of this reflection, insights related to the Sysco approach to ISDM tailoring were identified.

3.6.2 Selection of Case Organisation, Projects and Respondents

This research will examine ISDM tailoring as planned and executed by experienced practitioners on several large, complex, commercial Information Systems projects.

The following principles were used to guide the selection of appropriate sites:

- The case organisation should have a well-documented ISDM;
- There should be a commitment within the organisation to the application of the ISDM. It is not sufficient that the organisation possess a well-documented ISDM. If the ISDM is not regularly applied to projects, then opportunities to observe the tailoring of the ISDM would not be available;
- The organisation should regularly undertake work on large, complex projects for commercial customers. This will provide ample opportunities for selection of suitable cases for study;

- The organisation should be willing to provide access to the ISDM, to projects on which it is applied, and to the personnel assigned to work on those projects; and
- Suitable projects should:
    - involve work for external customers – i.e. the projects should be commercial, not in-house;
    - be large (where large is arbitrarily defined as having a contractual value in excess of ten million dollars and an expected duration in excess of six months).

These principles were used to guide the selection of the case organisation and case projects.

"Sysco" (a nom de plume) was chosen as the case organisation as it met each of the selection principles documented above. Whilst Sysco is the only organisation to be examined in this study, it has extensive experience in the development and use of ISDMs, particularly in the delivery of complex IS projects. The Sysco environment provided a stable, known culture with respect to IS development, with a significant amount of the organisation's collective knowledge and experience being captured in the form of its ISDM, even though individual projects may exhibit significant instability. The Sysco ISDM was comprehensively documented and very broad in scope.

It is generally accepted that when constructing an Information System, the use of an ISDM is of benefit (Avison and Fitzgerald 2003b; Beynon-Davies and Williams 2003), with the benefits including standardisation, providing for the capture and recording of collective knowledge and experience, improving the quality of the delivered product, and making the development process more manageable (see Section 2.3). Within Sysco, the Sysco ISDM is seen within the organisation as providing a significant competitive advantage in that it encapsulates a very large body of learning, helping to avoid repeating mistakes made during subsequent projects. Its application also provides standardisation of terminology, and input and output artefacts which assist in reducing the time required to commence and deliver a project. All projects above a specified contract value must apply a tailored form of the Sysco ISDM.

Sysco, by virtue of its global footprint within the IT services industry, regularly engages in very large, complex projects which often feature large numbers of interfaces between existing systems and the new system. An organisation such as Sysco, which works in this space, provides ideal opportunities to view the processes of ISDM tailoring on complex projects.

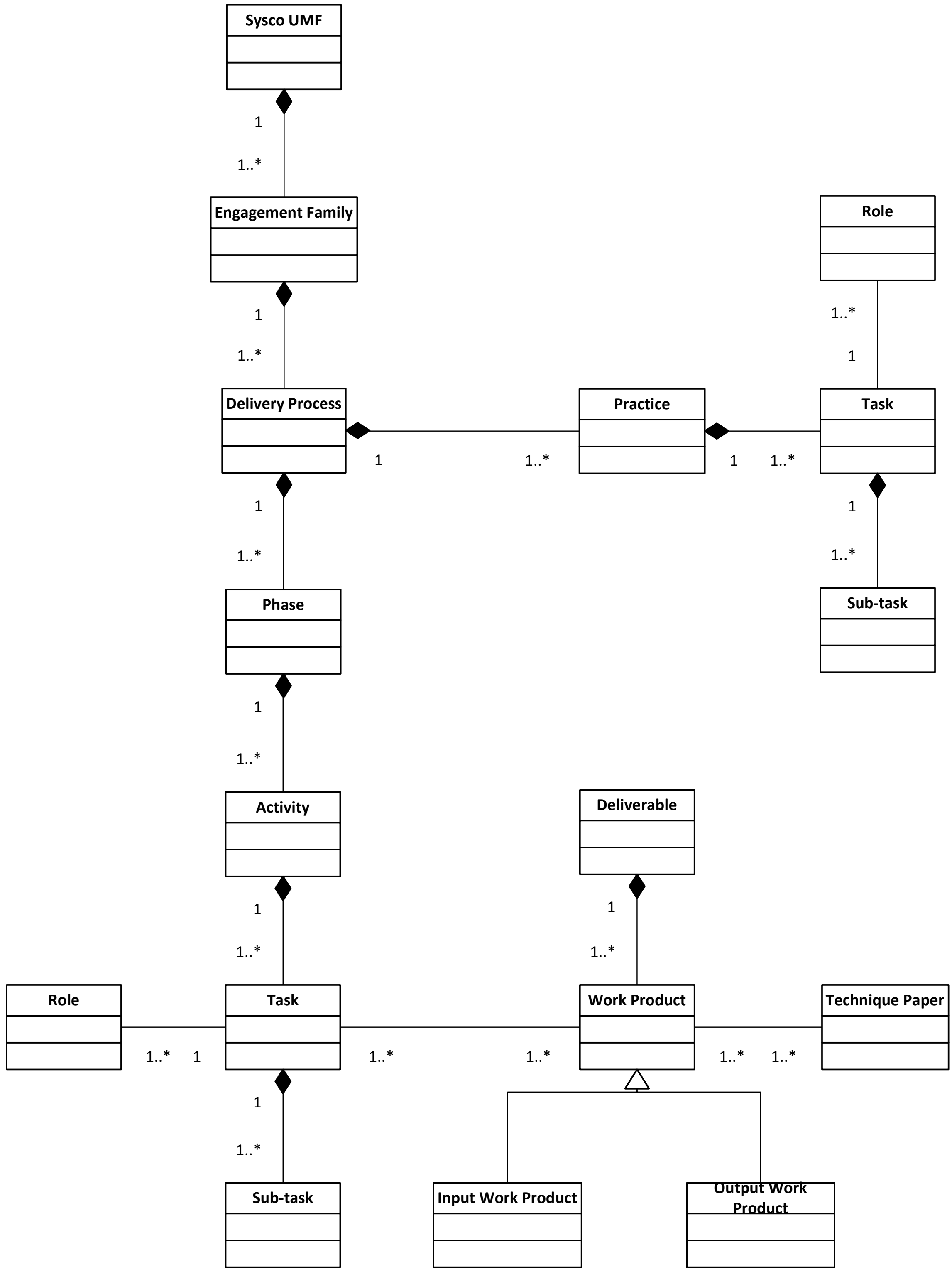

Figure 12 - Structure of Sysco ISDM Represented in UML Notation

3.6.2.1 The Sysco ISDM

The Sysco methodology has been developed and refined as a result of its use on thousands of projects, of different sizes, globally. It consists of a framework which supports a number of what are referred to as "Engagement Families", each of which consists of sets of Delivery

Processes which share close relationships within a common area of customer need and which describe how to deliver a project in terms of a work breakdown structure. Figure 12 represents the structure of the Sysco ISDM using UML notation – note that Appendix A provides an explanation of the symbols used in this diagram.

The use of the Sysco ISDM is documented as a standard practice (which would be classified as part of the Methodology-as-Documented (Fitzgerald 1998)). When applying Sysco's methodology a selected Delivery Process is tailored further at the commencement of a project to suit the particular characteristics of that project.

A key aspect of the Sysco approach to tailoring of their ISDM is an activity called a Method Adoption Workshop (MAW). Within a MAW, features of the project (such as the type of project, duration, pricing structure) are taken into account in order to select a Delivery Process upon which to base the project's ISDM. The MAW also identifies the nature of the tailoring to which the selected base Delivery Process should be subjected: the addition, deletion, or modification of the set of Work Products specified by the base Delivery Process.

MAWs vary in length and formality, but nonetheless, Sysco expects that a MAW of some form will be conducted on every project. On larger projects, responsibility for the preparation for, and execution of a MAW, rests with specialists known as Method Exponents.

Through a variety of personal and professional contacts, representatives of Sysco were approached to seek their approval to participate in the study. Commitment to participation was forthcoming.

3.6.2.2 Case Projects

Within Sysco, case projects were selected because they provided unique insights into the phenomenon of interest. That is, rather than attempting to cover all possible variations in the types of project and instances of tailoring, the intention was to develop a deep understanding of ISDM tailoring in selected cases. As such, theoretical (Mason 2002) rather than representative sampling was applied when selecting cases at Sysco.

A number of candidate projects were identified. These were projects that involved work for external customers, were large, and were "complex", where the complexity arises, in large part, due to the number of interfaces to other systems, both in the "as is" and "to be" states.

Once a candidate set of projects had been identified, the researcher established contact with the project manager of each project to determine their preparedness for their project to be adopted as a case. As a result, three projects were selected.

No claim is made that the cases presented represent typical examples of ISDM tailoring. Rather, they were selected because they offered an opportunity for a rich, deep exploration of the phenomenon of ISDM tailoring, with each case potentially offering additional insight into this phenomenon. Cases were thus chosen as they afforded opportunities to validate the model of ISDM tailoring proposed in Section 4.3.1 which looked at the temporal aspects of tailoring, rather than to investigate specific characteristics of ISDM tailoring.

Data collection ceased when many of the findings of the third case reinforced observations from the previous two, suggesting that "theoretical saturation" had been reached (Glaser and Strauss 1967).

3.6.2.3 Respondents

In order to identify suitable respondents to participate in MAWs, and to interview, a set of principles were identified. These were that respondents should:

- Have significant involvement in the execution of a specific project or projects under study;
- Have a high level of familiarity with one or more of Sysco's ISDMs;
- Have significant practical experience in the tailoring of Sysco's ISDMs on large, complex projects for external (commercial) customers; and
- Ideally, hold Sysco certification in the tailoring of Sysco ISDMs.

The application of these principles resulted in a number of potential respondents being identified and approached through a third party. All candidate subjects who were approached agreed to the request to participate in an observed MAW and/or interview or interviews.

All of the participants in the MAWs were male, and all but one of the subjects interviewed were male. This was not considered an issue, as the role of gender (if such a role exists) was outside the scope of the study.

Across the study, MAWs were observed and interviews were conducted with various participants in ISDM tailoring. Table 3 summarises the number of interviewees and interviews conducted in each part of the study. Note that some interviewees were interviewed more than once.

Table 3 - List of Sysco Personnel Involved in Observed MAWs and Interviews

Pilot Study

Interviews

# of interviewees	Interviewee Roles	# of Interviews by Role	Years of IT Industry Experience
7	Senior IT Architect (PITA-1)	3	25
	Senior IT Architect (PITA-2)	1	14
	Senior IT Architect (PITA-3)	1	12
	Senior IT Architect (PITA-4)	1	8
	Method Exponent (ME-1)	1	25
	Method Exponent (ME-2)	2	17
	Method Exponent (ME-7)	1	24

MAW Observation

Workshop #	Participant Roles	Years of IT Industry Experience
Workshop 1	Executive IT Architect (OITA-5)	38
	Senior IT Consultant (OITA-6)	20
	Senior IT Consultant (OITA-8)	19
Workshop 2	Senior IT Architect (PITA-1)	25
	Senior IT Architect (OITA-9)	22
	Executive IT Architect (OITA-10)	34

Case 1

Interviews

Number of interviewees	Interviewee Roles	# of Interviews by Role	Years of IT Industry Experience
6	Method Exponent (ME-6)	3	11
	Senior IT Architect (PITA-1)	1	25
	Chief IT Architect (CITA-1)	1	19
	Release IT Architect (RITA-1)	3	17
	Release IT Architect (RITA-2)	1	15
	Release Project Manager (RPM-1)	2	21

MAW Observation

Participant Roles	MAW Type		
	Informal Single Participant MAWs	Informal Multiple Participant MAWs	Formal Multiple Participant MAWs
Method Exponent (ME-6)	5	17	

Release IT Architect (RITA-1)		15	
Chief IT Architect (CITA-1)		2	
Program IT Architect (PITA-1)		11	
Release IT Architect (RITA-2)		4	
Test Lead (TL-1)		3	
Release Project Manager (RPM-1)		6	
Other Project Manager (OPM-2)		2	

Case 2

Interviews

Number of interviewees	**Interviewee Roles**	**Number of Interviews by Role**	**Years of IT Industry Experience**
3	Senior IT Architect (RITA-2) Method Exponent (ME-6) Release Program Manager (RPM-2)	2 3 4	14 11 21

MAW Observation

Participant Roles	**MAW Type**		
	Informal Single Participant MAWs	**Informal Multiple Participant MAWs**	**Formal Multiple Participant MAWs**
Method Exponent (ME-6)	5	3	
Release IT Architect (RITA-2)		3	
Release Project Manager (RPM-2)		2	

Case 3

Interviews

Number of interviewees	**Interviewee Roles**	**# of Interviews by Role**	**Years of IT Industry Experience**
4	Method Exponent (ME-1) Method Exponent (ME-4) Method Exponent (ME-8)	3 3 1	25 22 27

MAW Observation

Participant Roles	**MAW Type**		
	Informal Single Participant MAWs	**Informal Multiple Participant MAWs**	**Formal Multiple Participant MAWs**
Method Exponent		3	1

(ME-1)			
Method Exponent (ME-4)		3	0
Method Exponent (ME-8)		1	0
Release IT Architect (RITA-4)		0	1

3.6.2.4 Client Organisation

One of the criteria for selecting the case organisation was that it should regularly undertake work on large, complex projects for commercial customers. Each of the three case projects reported in this thesis was undertaken by Sysco on behalf of OzTel. OzTel is the largest telecommunications corporation operating within Australia, with operations in fixed line, mobile telephony and internet. OzTel's position of market dominance was largely obtained as a legacy of its history as a monopoly operator within a highly regulated operating environment. Following complete deregulation of the telecommunications sector on 1 July 1997, a number of competitors entered the market, particularly in the emerging sectors of mobile technologies and internet access. As a direct result, OzTel found revenues from its core copper-based network decreasing. It also found itself under pressure from competition in the emerging markets of mobile telephony and internet service provision.

At the time this study was undertaken, OzTel was embarking on a significant program of transformation in response to these competitive pressures, with an aim of streamlining its business in order to reduce cost. The scale of this program was such that it offered opportunities for examining tailoring of ISDMs.

3.6.2.5 Researcher Role

At the commencement of the study, no employment relationship existed between the researcher and Sysco. However, by coincidence, following the completion of the Pilot Study, the researcher was offered employment at Sysco through a relationship unrelated to this research. The researcher had been engaged in a part-time capacity as a tutor in a Masters level university Systems Architecture course, and was approached by the lecturer to join Sysco.

On commencing employment with Sysco, the researcher was a member of the development team in the cases presented in the first two cycles of research. However, his influence on ISDM tailoring was minimal, as it was in research cycle 3 where the researcher was not a member of the development team.

The researcher, however, retained an awareness of the potential for the employment relationship to influence the way in which events and comments were interpreted. To that end, the researcher worked hard to retain a sense of objectivity and to critically evaluate the data collected in his role as a researcher.

3.6.3 Selection of Data Collection Methods

In both the Pilot and Qualitative Studies, a variety of methods for the collection of qualitative data were employed. These are detailed in the sections which follow.

3.6.3.1 Observation of ISDM Tailoring Workshop Sessions

Central to understanding ISDM tailoring is to observe practitioners as they go about executing the task of tailoring the Sysco ISDM to suit the characteristics of a specific project.

Within Sysco, a key component of this task is conducting a Method Adoption Workshop (or MAW). MAWs vary considerably in their length and degree of formality. A MAW for a small project may only involve a single practitioner and be completed in a day or less, whereas MAWs for larger, more complex projects can involve many personnel and run for several days.

The MAWs were audio recorded for subsequent analysis of participants' statements and behaviours. In addition, the researcher recorded as hand-written field notes, comments and events related to the selection of an ISDM and its subsequent tailoring, as well as observations of the physical setting. A sample of the form used to record these observations is available in Appendix B. The audio recorded and written data captured during the observation of these tailoring workshops were subsequently transcribed into an electronic format, with the addition of post-event reflections. This data was then analysed and used as an input to the creation of schedules for the conduct of follow up interviews with key participants.

3.6.3.2 Interviews

Semi-structured interview strategies were applied throughout this research because they lead to richer, more informative explanations of the phenomenon of interest (Fontana and Frey 2000) – see Section 3.5.1.1. In addition, semi-structured interviews enable the exploration of "perceptions and opinions of respondents regarding complex and sometimes sensitive issues" (Barriball and While 1994).

Interviews were conducted with two key target groups:

- Experienced Sysco ISDM tailoring practitioners, to develop an understanding of the Sysco ISDM and the practitioners' perspective on the ISDM and the manner in which they go about tailoring it; and
- Key participants in the MAWs, to probe for explanations of observations made during the ISDM tailoring workshops.

In each case, an interview guide was developed and used as a checklist of issues that had to be covered during each interview rather than as an explicit statement of the interview questions (see Appendix A). Such an arrangement puts the same basic questions to all interviewees but structures the interview as a conversation with the participants. The questions were designed to allow the interviewee to describe specific situations as examples and to provide new insights and explanations for phenomena observed during the workshops.

Interviews were audio-recorded with participant agreement and transcribed by the researcher and subsequently analysed against themes exposed by the questions asked, as well as any related new themes raised by the interviewees.

3.6.3.3 Document Collection

Documents were collected which:

- Described the un-tailored form of the Sysco ISDM;
- Provided guidance on how to execute various tasks (including guidance on the tailoring process);
- Recorded the tailoring process – for example workbooks which listed decisions about whether or not specific work products were to be included in the tailored method, along with a reason for the decision;
- Represented informal working notes (such as diagrams or text) created by participants in ISDM tailoring; and
- Electronic mail exchanges between key participants in the tailoring process.

Documents of these types were collected because they provided valuable background information about ISDM tailoring, and helped to set the context for many of the tailoring decisions which were made. In addition, they offered the possibility of providing triangulation with data collected by other means – for example, through observation or interview.

3.6.3.4 Associated Ethical Considerations

Prior to commencing data collection, approval was obtained in accord with the RMIT University Ethics Policies and Procedures (RMIT 2013).

3.6.4 Selection of Data Analysis Methods

Candidate qualitative data analysis methods have been introduced in Section 3.5.2. In this section the specific methods that have been applied are elaborated.

The key method of analysis adopted was coding of the many transcripts of interviews and ISDM Tailoring Workshops. The specific processes adopted for this analysis are described below.

3.6.4.1 Interviews

An initial set of codes with which to analyse interview transcripts was developed during the Pilot Study drawing on the literature (see Appendix I). This set of codes was then used as the starting point for coding data in the Pilot Study. Concepts and themes, such as the identification of an intermediate ISDM state, and the ideas of "in flight" and planned tailoring which emerged during the Pilot Study led to modification of the coding schema, where modifications could include the modification of a code for a specific characteristic or influence; the creation of codes representing new characteristics or influences; and the deletion of a specific characteristic or influence from the proposed set. Notes and interview transcripts were coded shortly after collection, using the set of codes in use at that point in the research.

Interview transcripts were examined with the principal focus being on line-by-line analysis, supplemented as necessary with sentence and paragraph analysis to form an understanding of the meaning of specific responses (Strauss and Corbin 1998, p.120).

In order to improve the rigour associated with the coding of text, samples of the output of the coding exercise were independently checked by one or more of the research supervisor(s) in order to confirm the soundness of the schema used and their application.

3.6.4.2 Observation of ISDM Tailoring Workshop Sessions

Transcripts of audio recordings of ISDM tailoring sessions were analysed as described in the section above. During sessions of direct observation of ISDM tailoring, the researcher recorded field notes comments and events related to the selection of an ISDM and its subsequent tailoring. The field notes were analysed informally, by reading and re-reading (Peräkylä and Ruusuvuori 2011). Attempts were also made to map comments and themes to the codes which had been generated during the interviews with ISDM tailoring specialists and the tailoring sessions themselves.

3.6.4.3 Document Analysis

Documents were analysed using a less formal approach (Peräkylä and Ruusuvuori 2011).

Each case typically generated a large volume of documents – for example, the third case generated in excess of 500 megabytes of emails, PowerPoint presentation, Excel spreadsheets, Word documents and sundry materials.

These were first examined to determine their relevance to ISDM tailoring. Those which were assessed to be of little value were removed from further analysis. The remaining documents were read several times (as per Peräkylä and Ruusuvuori (2011)) to identify themes, and tailoring events (potentially including the nature of a tailoring event, and/or the motivation for that event) present.

3.6.5 Data Management

Qualitative research typically generates large volumes of data, and the management of that data is consequently a major issue (Miles and Huberman 1994). A comprehensive strategy for the management of this data assisted in the "Analyse" and "Reflect" stages of the structured-case framework.

3.6.5.1 Contact Summary Sheets

A contact summary sheet (see Appendix E) was completed for each contact. This sheet recorded:

- Name of contact
- Date of contact, its location, and an identifying code, unique throughout the study
- Professional information such as:
    - Extent of experience within IT generally, and Sysco specifically
    - The role which the contact occupies
    - Extent of training, both academic and on the job
- Information about the project
    - A brief description
    - An overview of the management structures

- Whether an ISDM is being used on the project and if so, what is it?

- Researcher observations including key issues and interesting incidents, themes and comments which require investigation with the next contact.

Contact Summary sheets were generally completed within 24 hours of an interview or workshop with a worst-case scenario being completion within 48 hours. Data collected via a digital audio recorder was transcribed over a longer period, but certainly within a period of 14 days.

3.6.5.2 Raw Notes and Recordings

Audio recordings were made of workshops conducted in both the Pilot Study and in the each of the three case studies which formed the Qualitative Study. In addition, each interview was audio recorded. Each audio file was renamed to make the date and time of the workshop readily understood. Each file was then subjected to transcription, and stored securely.

Documents generated or used in an ISDM tailoring workshop or by an interviewee were collected. Those in hard copy form were indexed and then stored securely in a locked filing cabinet. Most documents were collected in an electronic format – these were indexed and then stored for subsequent analysis.

Storage of all collected data, whether hard copy or electronic, was in accordance with RMIT University policy (RMIT 2013).

3.6.5.3 Data Collection and Analysis Templates

A number of templates were created during the research program for the purposes of data collection and analysis. Several of these have been introduced earlier in this thesis. A consolidated list, their intended purpose, and a reference to their location within the thesis is provided in Table 4 below.

Table 4 - Data Collection and Analysis Samples and Templates

Location	Template Name	Template Purpose
Appendix B	MAW Observation Log	Used to record background information relevant to an ISDM tailoring session, and for recording information relevant to the episodes of tailoring

		observed in that session
Appendix C	Sample Method Exponent Interview Guide	Provide a standard set of “seed” questions to guide the conduct of interviews with Sysco Method Exponents
Appendix D	Sample Coding Sheet	Documents the initial set of codes used to mark up interview transcripts
Appendix E	Contact Sheet Template	Used to capture biographical, educational and other background information on subjects in interviews and MAW observation sessions
Appendix J	Document Summary Form Template	Used to record key details of documents captured as part of a case
Appendix M	Artefact Comparison Record Template	Identifies pairs of artefacts of the same type but different versions being compared, and records the nature of differences between them

3.7 Chapter Summary

This chapter has discussed the selection of a research methodology, and the research design that will be used to conduct the investigations reported in this thesis.

Considerations that shape the selection of an appropriate methodology have been reported, including the research questions (Section 3.2), the nature of qualitative and quantitative research, the requirement for relevance and rigour when conducting research, and the nature of the theory outcomes that are being sought (Section 3.3).

Following a review of a number of candidate qualitative research methodologies, the choice of a structured-case approach has been justified (Section 3.4).

A selection of candidate data collection and analysis techniques that might be applied has been presented (Section 3.5). Consistent with the structured-case approach, a research design has been prepared, including a Pilot Study phase and a Qualitative Research phase (Section 3.6.1).

Finally, the choice of specific cases for study during each phase, the identification of respondents and the choice of specific data collection and analysis techniques that will be employed, has been discussed (Sections 3.6.2 to 3.6.5).

4 THE INITIAL CONCEPTUAL FRAMEWORK (CF_1)

4.1 Introduction

In this chapter, the synthesis of an Initial Conceptual Framework (CF_1) to seed the research into ISDM tailoring is presented, as suggested by the structured-case framework described in Chapter 3. The development of CF_1 is undertaken by drawing upon four inputs: research themes, existing literature, expert opinion elicited through interviews with ISDM tailoring practitioners and observation of ISDM tailoring in workshops, and the researcher's theoretical foundations.

Section 4.2 describes the research themes which shaped CF_1 (Section 4.2.1), including the identification of the key concepts which emerged from a review of the literature (Section 4.2.2). The inputs to CF_1 which emerged from a series of workshops and interviews with ISDM tailoring practitioners (and which might be characterised as "expert opinion") are identified (Section 4.2.3), together with a description of the researcher's theoretical foundations that shaped the research (Section 4.2.4). Finally, the synthesis of CF_1 from these various inputs is described (Section 4.3).

4.2 Inputs to CF_1

4.2.1 Research Themes

The four inputs to CF_1 are described in Section 3.4.2.1. One of these is "Research Themes", which shape the study. For this research, the research theme was "***Why are technologies in use different to technologies as designed?***".

This broad theme informs the synthesis of CF_1 as reported in Section 4.3.

4.2.2 Literature

Chapter 2 presented a review of literature relevant to ISDM tailoring. Several key ideas emerged from that review including: that an ISDM can exist in one or more states; that there are a number of different approaches to tailoring that can be summarised as "top-down" or "bottom-up"; and that tailoring can be undertaken in either a pro-active or reactive way. In the section which follows, a summary relevant to the development of CF_1 is presented.

4.2.2.1 Methodology States

In "An Empirically Grounded Framework for the IS Development Process", Fitzgerald (1998b) described a framework which represented ISDM tailoring including an explicit distinction between the “Original Formalized Methodology” and the “Methodology-in-Action”. The framework proposed by Fitzgerald was presented in Section 2.4.6.3.

Stripping away the influences on ISDM tailoring posited in this model leaves a simple model consisting of just two states (“Original Formalized Methodology” and “Methodology-in-Action”) and the transition between them. This simplified representation is shown in Figure 13.

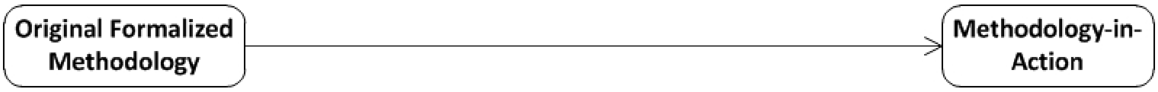

Figure 13 - Simplified Representation of the Framework for the IS Development Process

A model as parsimonious as this has some attraction when seeking to develop theory, in view of its simplicity. This model informed the synthesis of CF_1, reported in Section 4.3.1.

4.2.2.2 Approaches to Tailoring

Two bodies of relevant literature have been introduced in Chapter 2:

- Contingency Based Approaches to ISDM Tailoring

  A contingency based approach to ISDM tailoring is predicated on the idea that there is no single "best way" to achieve success when managing or planning (which are key activities in Information Systems Development) and that for any project or system, there are variables which influence the performance of the information system (the “contingency variables”). A contingency based approach posits that the better the fit of these variables to the design and use of the IS, the better the performance of the IS (Weill and Olson 1989, p.63). Contingency approaches to ISDM tailoring adopt a “top-down” approach, in which a complete ISDM is selected from a library of ISDMs, based on which represents the best fit for known or assumed project conditions. Contingency based approaches to ISDM tailoring have been discussed in Section 2.5.1.

- Improvisation Approaches to ISDM Tailoring

  Improvisation in any discipline stresses the importance of adapting while performing a task, rather than following plans (such as the documented forms of ISDMs) (Weick 1998). Improvisation can be characterised as "purposeful human behaviour…ruled at the same time by intuition, competence, design and chance" (Ciborra 1999, p.78). The key components of improvisation are that responses are immediate, where learning and adapting to the situation at hand occurs. Given the dynamic environment in which IS development occurs, there may be a need for tailoring of the ISDM in which the practitioner responsible for tailoring of the ISDM adopts an "improvised" approach.

Section 2.5.2 includes a discussion of improvisation.

The notions of contingent and improvised tailoring types informed the synthesis of CF_1, as reported in Section 4.3.1.

4.2.3 Expert Opinion

A Pilot Study was undertaken to gather expert opinion about the research theme as part of developing CF_1. A pilot study is useful when developing theory, to assist in identifying the data to be collected, and the procedures to be used for collection (Yin 2003). Expert opinion was sought by observation of ISDM tailoring pilot workshops and interviews with selected ISDM Tailoring Practitioners (Sections 4.2.3.1 and 4.2.3.2).

4.2.3.1 ISDM Tailoring Workshops

Planning

A key element of the way in which Sysco methodologies are applied to projects is the conduct of a Method Adoption Workshop or MAW. In a MAW, the Method Exponent[2], either on his own or in conjunction with other stakeholders, selects an unmodified ISDM from the Sysco suite of methodologies and then tailors it to fit with the project's characteristics at that point in time. This unmodified form of the ISDM is analogous to the "Original Formalized Methodology" referred to by Fitzgerald (see Section 2.4.6.3).

The purpose of the Pilot Study was to develop initial understanding of how ISDMs are tailored in complex, commercial Information Systems projects.

Data Collection

Two laboratory MAWs were subsequently conducted and observed. Each of the laboratory MAWs was conducted on Sysco premises, and each included three highly experienced Method Exponents. Participants had an average length of IT experience in excess of 15 years, and had worked on complex Information Systems projects for many years.

In order to provide a context for the initial collection of "expert opinion" of ISDM tailoring, as discussed in Section 3.6.1.1, the Method Exponents in each session were presented with a case study which described at a high level the IT requirements of a notional organisation.

[2] Method Exponent - A Method Exponent (abbreviated to "ME") is a practitioner with experience and training in the selection and tailoring of the Sysco methodology

Each group of Method Exponents then worked for several hours selecting an appropriate unmodified ISDM. They then tailored the selected ISDM based on the information provided. Table 5 provides a summary of the participants, their level of IT industry experience, and their current principal job role.

It should be noted that this approach differs in several ways from the usual manner in which a real-life Method Adoption Workshop is conducted. Firstly, the problem was a relatively small one, not possessing the breadth of scope or complexity often encountered by these practitioners.

Secondly, the time allowed for the selection and tailoring of an ISDM had to be constrained to fit within the single day workshop, whereas in practice a Method Adoption Workshop may run for a number of days.

Finally, the Method Exponents worked with peers in the workshop, whereas typically they would lead a multi-disciplinary group of professionals.

Table 5 - List of Participants in Pilot Study MAWs

Workshop #	Participant ID	Principal Job Role	Years of IT Industry Experience
1	OITA-5	Executive IT Architect	38
	OITA-6	Senior IT Consultant	20
	OITA-8	Senior IT Consultant	19
2	PITA-1	Senior IT Architect	25
	OITA-9	Senior IT Architect	22
	OITA-10	Executive IT Architect	34

Each workshop was audio recorded. In addition, the researcher recorded comments and events related to the selection of a Methodology-as-Documented and its subsequent tailoring as field notes. At the conclusion of each workshop, participants were questioned about issues or points of interest observed during the workshop which required clarification or elaboration.

Diagrams produced during the method selection and tailoring process were collected. Additional materials, such as printouts from the Sysco methodology database which were used in the tailoring process, were also collected. A list of the artefacts collected can be found in Appendix G.

Analysis

Analysis of the field notes was undertaken using the analysis techniques described in Section 3.6.4. This required the researcher to review notes taken against a set of candidate characteristics and influences on ISDM tailoring developed from the review of the literature. As required, to amplify these notes, relevant sections of the audio recordings were revisited.

Where observations could not be matched well to one of the candidate characteristics and influences, additional elaborating comments were made to enable more detailed subsequent analysis. This subsequent analysis often resulted in the identification of new characteristics or influences.

Numerous ISDM related documents were also analysed including printed extracts from the documented form of the selected Sysco ISDM, hand drawn diagrams created by practitioners in the course of selecting and tailoring the ISDM in response to the case problem supplied in the laboratory MAW, and digital photographs of whiteboard drawings.

Where there was conflict with the set of candidate characteristics and influences on ISDM tailoring, a number of responses were possible including:

- Modification of a code for specific characteristic or influence;
- Creation of codes representing new characteristics or influences; and
- Deletion of a specific characteristic or influence from the proposed set.

These documents were typically inputs to, or outputs from, the tailoring process. Unlike the observations of the workshops captured in the field notes and interviews with ISDM Tailoring Practitioners (described in the next section), these materials made little direct contribution to the development of the Initial Conceptual Framework. Instead, they acted as background material, and provided an opportunity for the researcher to become familiar with the terminology, notation and vocabulary associated with the Sysco ISDM.

Reflection

ISDM States

Data collected and analysed from the observations of the two laboratory MAWs provided evidence in support of an intermediate ISDM state, and for differentiating the transitions which occur between states into two types.

During each of the two workshops, ISDM tailoring practitioners were observed selecting a base, unmodified ISDM from the suite of ISDMs created by Sysco. Then, within each of the MAWs, they were then observed to engage in discussions as to how the selected unmodified

ISDM should be tailored. They made it clear, however, both during their discussions in the MAW, and in subsequent interviews, that this tailored form of the ISDM would not necessarily be used to support project development, but may in fact be subjected to additional tailoring. Observations such as these support the positing of a third state in this thesis.

For instance, OITA-10 remarked that "*Too many people within Sysco think that tailoring the Method is trivial. They're completely wrong. Getting the method right at the start is important – you need to understand enough about the project to select the right Engagement Model, because if you get that wrong it's an uphill battle*".

Here, OITA-10 stresses that the initial selection and tailoring of the ISDM is important and is based on **known** or **assumed** information. OITA-10 also stresses that rather than producing a single, tailored form of the ISDM which is then used to support development, many of these new instances of the ISDM in fact do **not** get used to support development but are themselves tailored further. This provides further evidence in support of the identification of a third state of an ISDM. A formal definition of this is provided in Section 4.3.1.

This idea that there are potentially many instances of the ISDM created between the original, documented form of an ISDM (what Fitzgerald (1998b) refers to as the "Original Formalized Methodology") and the form which is used to support development (the "Methodology-in-Action" in Fitzgerald's (1998b) parlance) was frequently raised throughout the interviews.

Transitions

Observations made during the laboratory MAWs also provided support for the notion that transitions between the states of an ISDM can be differentiated into **contingent** and **improvised** transitions.

For example, during the MAW, OITA-6 commented "*When we commence an engagement like this, we usually base tailoring decisions, including selection of the base Engagement Model, on known features of the proposed project. Unfortunately, we're often engaged so early that there isn't a lot of information actually known for sure, so we document as many assumptions as we can and tailor around them*." In other words, decisions about how to tailor the ISDM are made by taking into account known or anticipated project conditions. As a result, such tailoring decisions tend to be pro-active. Within the model to be presented in Section 4.3.1, such tailoring events are classified as **contingent** in nature.

Where information changes during project preparation and execution, the response to tailoring can be very different in that it requires the practitioner to leverage their knowledge and experience. Within the model to be presented in Section 4.3.1, such tailoring events are classified as being **improvised** in nature.

The set of proposed states and transitions identified within this section will inform the synthesis of CF_1 as reported in Section 4.3.

4.2.3.2 Interviews with ISDM Tailoring Practitioners

Planning

Interviews were arranged with seven of the key participants in ISDM tailoring such as IT Architects, who often fulfil the role of Method Exponent. As follow-up interviews were required with two of the seven interviewees (one of whom was interviewed three times), a total of ten interviews, each lasting at least an hour, were conducted with these practitioners. Each interview was recorded for subsequent transcription and analysis. Interviews were conducted using a semi-structured interview technique. Appendix A contains the schedule of semi-structured questions used in conducting the interviews with practitioners. The questions put were adapted in response to practitioners' comments.

These interviews aimed to better define the scope of the study, to refine the area of interest, and to develop an initial understanding of the Sysco ISDM and the manner in which it was applied and tailored on projects.

Data Collection

Table 6 summarises the interviewee's principal roles and years of IT industry experience. Note that one interviewee, PITA-1, also participated in the ISDM tailoring workshops. Note that Appendix D provides biographical details of MAW participants.

Table 6 - List of Sysco Method Exponents Interviewed in Pilot Study

Interview #	Interviewee ID	Principal Job Role	Years of IT Industry Experience
1	PITA-1	Senior IT Architect	25
2	PITA-2	Senior IT Architect	14
3	PITA-4	Senior IT Architect	8
4	PITA-3	Senior IT Architect	12
5	ME-2	Senior IT Architect	17
6	ME-7	Method Exponent	24
7	ME-2	Senior IT Architect	17

8	PITA-1	Senior IT Architect	25
9	ME-1	Senior IT Architect	25
10	PITA-1	Senior IT Architect	25

Analysis

Audio recordings of the interviews with practitioners were transcribed within 48 hours, and then coded using the initial set of codes referred to in Section 3.6.4.1. Codes were not aggregated, but decomposed logically from areas of potential interest identified during the literature search.

Concepts and themes which then emerged during the coding of transcripts (and from the analysis of documents) often led to modification of the coding schema, with some codes being eliminated from the schema, and others being added. This, for example, led to codes which related to a third state in which an ISDM may exist being defined. Similarly, codes which pertained to two different forms of tailoring, that planned in advance and that which occurred spontaneously, were also defined. The initial set of codes thus only indirectly led to the development of the Initial Conceptual Framework, with the refinement of them during the course of the study (e.g. following interviews) leading more directly to the development of the Initial Conceptual Framework.

An example of the initial coding schema can be found in Appendix D, whilst a sample of a coded interview transcript may be found in Appendix I.

The revised set of codes informed the synthesis of CF_1 reported in Section 4.3.

Reflection

Data collected and analysed from interviews conducted with ISDM tailoring practitioners provided evidence in support of defining an intermediate ISDM state, and for differentiating the transitions which occur between states into two types.

PITA-3 commented "*You know though, it's not like I do that and it's bang, all done, there it is. Often, I need to have what I've come up with reviewed and approved by the PM, the client etc. And many times, there needs to be further change made before they're happy to proceed and publish it to the team for use*".

For instance, during the interview conducted immediately post-MAW with PITA-4, he commented that "*…you have to understand that you don't just tailor the method and presto, that's what gets used. That may be the case if you're working on your own or if you have sole* *responsibility for it, but usually there's a process of consultation and negotiation with other stakeholders prior to producing something which gets used.*"

This idea that there are potentially many states between the original, documented form of an ISDM (the "Methodology-as-Documented") and the form which is used to support development (the "Methodology-in-Action") was frequently raised during the interviews. Evidence emerged during the interviews to support the idea that many instances of the Methodology-as-Anticipated ("M-a-A") could be created on a project.

For instance, during his interview PITA-4 commented that "*…so much changes on a project and you often have to react to it by changing the method – changing the content, adding or deleting deliverables and/or work products from what's been defined previously. Sometimes you then execute against that, other times you go through another round of consultation and negotiation to get it approved*". He further commented that "*…you have to understand that you don't just tailor the method and presto, that's what gets used. That may be the case if you're working on your own or if you have sole responsibility for it, but usually there's a process of consultation and negotiation with other stakeholders prior to producing something which gets used*".

The reference to needing to "*…react to it*" in the comment above by PITA-4 also provides evidence to support the differentiation of transitions between ISDM states into two types, previously identified in Section 4.2.2: a **contingency** based approach, and an **improvised** approach. The reference to "reacting" to project changes suggests that the tailoring response in this case is an improvised one.

Interviewees supported the differentiation of tailoring events into contingent and improvised forms. Thus, when PITA-3 comments that "*…at the start of a project when you do your initial tailoring even if you try to control things using assumptions…",* this implies that the initial tailoring is undertaken based on information known or assumed at that time – in other words, the tailoring event takes place in a pro-active manner. Such tailoring events are classified as **contingent** in nature (see Section 4.3.1.1).

However, PITA-3 subsequently comments that "*…you never know everything you need to know at the start of a project ...So it's inevitable I think, that you will have to respond or react to things as they occur during the project."* The key word here is "react" – as project features change, tailoring of the ISDM is undertaken in a reactive way, leveraging the knowledge and experience of the practitioner. Such tailoring events are classified as **improvised** in nature (see Section 4.3.1.1).

The interviews also uncovered the concept of recursive transitions between instances of the same state of an ISDM. For example, PITA-3 remarked that "…*I've been in many situations where you do some initial tailoring, and expect to use it to develop. But then, you go through the process of discussion and negotiation and you end up having to tailor THAT. And sometimes you go through many iterations of this, before you reach the point of using it in anger*". This comment reveals that in practice, an instance of a state of an ISDM may be tailored and result in a further instance of the same state.

The set of proposed states and transitions identified within this section informed the synthesis of CF_1 as reported in Section 4.3.

4.2.4 Theoretical Foundations

Theoretical foundations represent the view of the world which a researcher brings when commencing a program of qualitative research and comprises the beliefs, assumptions and expectations about the world (Guba and Lincoln 1994). Regardless of whether or not these are made explicit, they inevitably influence a program of research. Making these beliefs, assumptions and expectations explicit, however, makes it easier to understand the way in which the program of research is influenced, not just at its outset during the development of CF_1, but within each of the cycles of research, as the Conceptual Framework is revisited during the reflection stage.

Several key beliefs, founded on personal experience, shape the researcher's theoretical foundations. Central to this is the researcher's world view, which is a rational view of the world and of the solving of complex problems.

The researcher has also entered the field with his own understandings and beliefs (based on lengthy industry experience) of the way ISDMs are tailored and used in practice. These include:

- The use of an ISDM is beneficial to IS development, because it assists in the solving of complex problems through a structured process of decomposition, as well as improving the process of IS development, enhancing manageability and facilitating communication between developers; and
- ISDMs, whilst of benefit in developing IS, are rarely used as documented, and instead new instances of them are created specifically for each project.

These foundations informed the synthesis of CF_1, as now reported in Section 4.3.1.

4.3 Framework Synthesis and Representation

The framework representation notation selected is introduced and justified (Section 4.3.1). The synthesised model is presented, with each of the elements being justified in terms of the sources discussed in Sections 4.2.1 to 4.2.4. The sources drawn on in the synthesis of CF_1 are then presented in Table 9.

4.3.1 The Synthesised Model

The previous sections of this chapter identified four sources which, consistent with the application of the structured-case framework, have informed the development of the Initial Conceptual Framework presented in this section.

The high level Research Theme ("Why are technologies in use different to technologies as designed?") which was introduced in Section 4.2.1 helped to focus the study. A review of the literature identified a number of models which describe ISDM tailoring. Fitzgerald's (1998b) framework (discussed in Section 4.2.2) was chosen as the starting point for theory development in this study.

The literature review provided the basis for modelling an ISDM as existing in different states (see Section 2.4.6.3). Expert opinion on the application of ISDMs was elicited from data collected during the Pilot Study (Sections 4.2.3.1 and 4.2.3.2) which suggested that an ISDM can exist in a state intermediate between the initial, untailored, documented form (the "Methodology-as-Documented") and the final, tailored form used to support project development (the "Methodology-in-Action"). This is subsequently referred to in this thesis as the "Methodology-as-Anticipated".

Within this model, the term state is used in an abstract sense. In practice, it is instantiations of a state that are observed. In this sense, the model is consistent with the previous research of Fitzgerald (1998b) which informed the Initial Conceptual Framework presented here.

In addition, data collected during this Pilot Study indicated that the transitions which occur between the various states of an ISDM can take several forms. Specifically, it was identified that such transitions can occur in a planned, ahead of time of execution way, or alternatively, can occur in a manner where there is no gap between conception and execution of the transition. Chapter 2 introduced a range of potential theoretical models with which to view such tailoring. From the options presented, contingency and improvisation were selected as appropriate constructs to model these transitions. These concepts were introduced in Sections 2.5.1.1 and 2.5.2.4 respectively, and their selection justified in Section 2.5.3.

Fundamental to the development of CF_1 is the researcher's own Theoretical Foundations (Section 4.2.4) which can be summarised as taking a rational view of the world and to problem solving served to shape the research theme.

Given that it is proposed that there are three states in which an ISDM may exist, that a transition between any pair of states may occur in one of two ways, and that transitions between pairs of states can occur in either direction, there are a total of 18 possible transitions in the synthesised Initial Conceptual Framework (CF_1).

This synthesised model is shown in Figure 14.

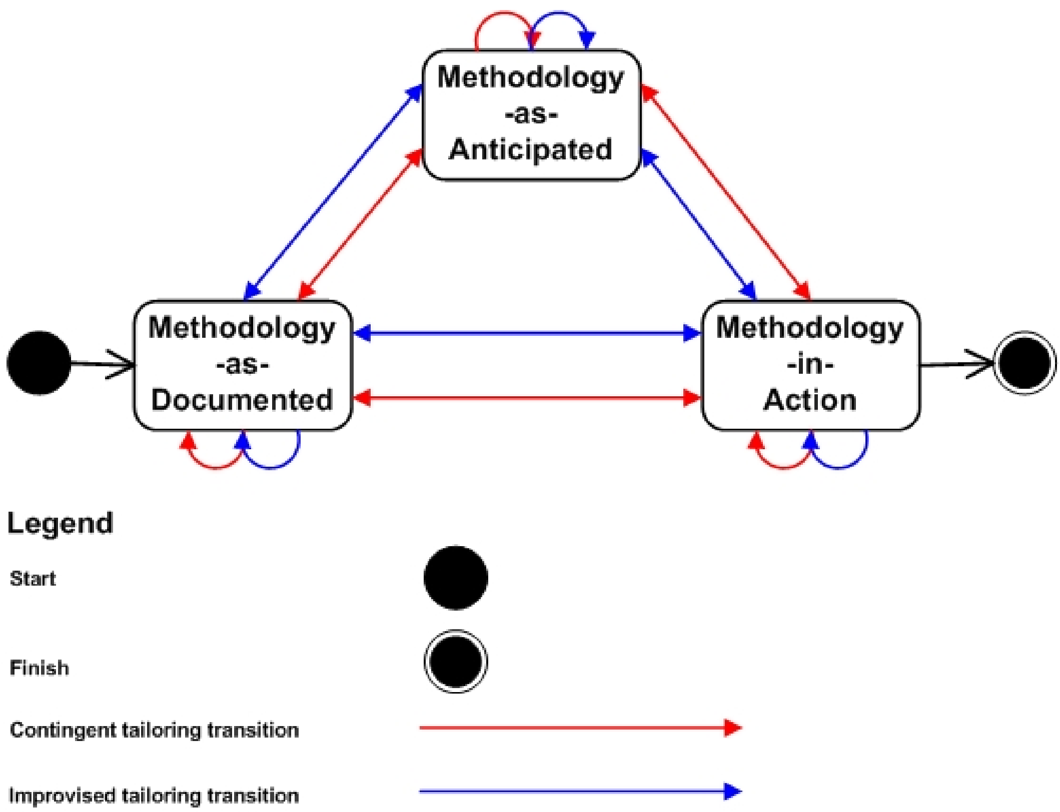

Figure 14 - Initial Conceptual Framework (CF_1)

The two key elements of the synthesised model are the ISDM states and transitions between these states. The proposed model is an elaboration of the framework proposed by Fitzgerald (1998b) which includes the Methodology-as-Anticipated. In order to represent these states and their associated transitions a suitable notation was required. A simplified form of the State-Transition Diagram developed by Yourdon (1988) was chosen. The notational devices, summarised in the legend contained within Figure 14, facilitate representation of these three key methodological states, and transition types between these states.

The synthesised model represents ISDM tailoring involving an instance of the **state** in which the ISDM exists at a point in time, and the **transition** which occurs when an ISDM moves from an instance of one state to an instance of another. These two elements of the synthesised model are defined in Table 7 and Table 8 respectively, and are explained in detail below.

It is important to note that CF_1 depicted in Figure 14 is complete in that it proposes transitions of two types, between each of three proposed states of an ISDM. These transitions are proposed to be bi-directional – for example, a contingent transition is proposed from the Methodology-as-Documented (M-a-D) to the Methodology-as-Anticipated (M-a-A), together with the possibility of transitions from the M-a-A back to the M-a-D. In addition, it proposes that there can be recursive transitions of each type from one state to a new instance of the same state. Note that Figure 14 simply posits that such transitions between methodological states may be possible. Whether or not any, or all, of these transitions occur in practice is investigated in the case studies reported in Chapters 5, 6, and 7.

It is also important to understand that CF_1 is only complete if the assumptions about the number of methodology states, and the types of transitions between these states outlined above are valid. Should these assumptions be shown to be invalid, (for example, if an ISDM is shown to exist in other states, or that other types of transitions between states may be possible) then CF_1 as shown, would not represent a logically complete model.

4.3.1.1 Definition of ISDM States

The following working definitions for the states in which an ISDM can exist are proposed (Table 7):

Table 7 - Definitions of ISDM States

State	Definition
Methodology-as-Documented	The original, documented, untailored form of an ISDM
Methodology-as-Anticipated	A form of the ISDM intermediate between the original, documented, untailored form, and the form of the ISDM being used to support development. This form of the ISDM, has been tailored, but has not been used to support development
Methodology-in-Action	The form of the ISDM being used to support development, tailored to reflect the characteristics of the project in progress

Note that, in considering the development of the Methodology-as-Anticipated, a distinction needs to be made between the commencement of a project, and the commencement of development activities.

A project typically commences well in advance of development activities. Activities which occur in the early stages of a project include things like developing schedules and budget estimates, drafting resource plans, establishing the team and its processes and selecting the undertaking the initial tailoring of the ISDM. It is this latter activity, which leads to the initial development of the Methodology-as-Anticipated.

It is this initial Methodology-as-Anticipated, specifically tailored for the characteristics of the project as they are known at the time of project commencement, which forms the basis of subsequent tailoring activities, some of which occur during further project commencement activities and others which may occur once development related activities commence.

4.3.1.2 Definitions of Transitions Between ISDM States

Existing models of ISDM tailoring have not classified the transitions between ISDM states into different types. They merely present an initial, untailored form and a final, tailored form that is used to support development. Evidence from the Pilot Study has led to the proposition that transitions between ISDM states can occur in two different ways: in a pro-active, planned ahead **contingent** way, or in a reactive **improvised** way in response to changes in project conditions.

The observation that there are often further instances of tailoring required after the commencement of a project, and that these occur in response to emergent project conditions often requiring the application of the practitioner's skill, experience, and adaptability supports the definition of two different forms of tailoring, differentiated according to whether or not the triggers for the tailoring event were foreseen and could therefore be planned for. These working definitions are provided in Table 8.

Table 8 - Definitions of ISDM State Transitions

Transition	Definition
Contingent Transition	Contingent tailoring refers to the modification of an ISDM to take into account known, or planned for conditions (the "contingency variables") or, where there are gaps in known or planned for conditions, documented assumptions. Contingent tailoring is characterised as a pro-active,

	planned ahead of time form of tailoring in response to one or more contingency variables exhibited by a project.
Improvised Transition	Improvised tailoring refers to modification of an ISDM as a response to emergent changes in one or more project conditions during the execution of a project. Improvised tailoring leverages the experience, opportunism, flexibility, and adaptability of the practitioner to tailor the ISDM to suit the characteristics of the situation at the moment of action (rather than it being planned ahead as is the case for contingent tailoring).

4.3.2 Sources Informing the Synthesis

The sources which informed the synthesis of CF_1 are presented in Table 9.

Table 9 - Sources Informing the Synthesis

Source	Key Element	Contribution to Synthesis
Research Themes (Section 4.2.1)	• In what ways are ISDMs tailored on large, commercial Information Systems projects?	This high level research theme provided general guidance to the research design.
Literature (Section 4.2.2)	• Initial, untailored state of ISDM • Final, tailored state of ISDM ready for use in support of development	These elements drawn from the literature have shaped CF_1 by identifying that an ISDM exists in an initial, untailored state (referred to as the "Methodology-as-Documented" or "M-a-D"), and in a final, tailored state which is used to support development (known as the "Methodology-in-Action" or "M-i-A")
	• Contingent transitions from one ISDM state to another	This element drawn from the literature identified that the transition between the M-a-D and the M-i-A states occurs in a pro-active, **contingent** manner in response to known or anticipated features of the project

Expert Opinion – Observation of MAWs (Section 4.2.3)	• Intermediate state of ISDM	Observation of the laboratory MAWs prompted the identification of a state in which an ISDM can exist additional to the M-a-D and M-i-A. This additional state is the result of, and/or has been subjected to, tailoring. However, it is not used to support the development effort and may in fact be subjected to many tailoring events prior to being used to support development. A formal definition of it is provided in Section 4.3.1.1
Expert Opinion - Practitioner Interviews (Section 4.2.3)	• Intermediate state of ISDM	Interviews with ISDM tailoring practitioners reinforced observations from the laboratory MAWs that prompted identification of a state additional to the M-a-D and M-i-A. As described above, this state is the result of, and/or has been subjected to, tailoring but is not used to support development
	• Improvised transitions from one ISDM state to another	Interviews with practitioners of ISDM tailoring shaped the notion that instances of tailoring can occur in an **improvised** manner, in that, as project execution takes place in a dynamic environment subject to rapid, unforeseen change, the ISDM practitioner may have to react by tailoring the methodology

Theoretical Foundations (Section 4.2.4)	• ISDM use is of benefit to IS development	Implicitly underpinning the research project is the assumption, documented as one of the theoretical foundations, that the application of ISDMs provides some form of benefit to IS development

4.4 Chapter Summary

In this chapter an Initial Conceptual Framework (CF_1), which represents ISDM tailoring, has been synthesised. This addresses research question one ("*What are the components of a model of ISDM tailoring that can be synthesised from the literature, expert opinion and available theoretical foundations?*"), and has been achieved drawing upon a variety of sources, including research themes (Section 4.2.1), literature (Section 4.2.2), observation of Method Adoption Workshops set in the laboratory (Section 4.2.3.1), practitioner interviews (Section 4.2.3.2), and relevant theoretical foundations (Section 4.2.4).

The resulting synthesised model (Section 4.3) is complete in that it posits the existence of transitions between each of the three states in which it is proposed an ISDM may exist. Further, it suggests that these transitions may be of one of two types, either contingent or improvised. Working definitions for the states and transition types have been presented (Section 4.3.1).

This synthesised model expresses the understanding of ISDM tailoring as at the conclusion of the Pilot Study, and draws to a conclusion the theory building phase of the study. The next phase of the research project involves comparison of this understanding with the practice of experienced practitioners on large, complex, commercial Information Systems projects, to evaluate the extent to which the understanding of ISDM tailoring captured in CF_1 reflects commercial practice.

5 RESEARCH CYCLE 1 – SUPPLY CHAIN PROGRAM FIRST RELEASE

5.1 Introduction

This chapter is the first of three in which results from case studies are presented, and which builds on the foundation provided by the previous four chapters. Chapter 1 presented the aim, significance and initial motivation for this program of research, whilst Chapter 2 provided an overview of key literature in the field of ISDMs, including defining the term “ISDM”. In addition, it identified motivations for the use and tailoring of ISDMs, before describing the present theory base and limitations of existing studies.

Chapter 3 described and justified the design of the program of research. It did this by first defining a set of research questions and then went on to consider a variety of strategies and data collection and analysis methods with which these research questions could be explored, before introducing and justifying the research design ultimately chosen to address those questions.

In Chapter 4, the development of an Initial Conceptual Framework (CF_1) which was used to seed the representation of ISDM tailoring was presented. The process of developing CF_1 using the Structured-Case research strategy was reported.

In this chapter, the first cycle of the qualitative research is described. The chapter introduces the case organisation studied throughout this research, presents results related to the validating of the Methodology-as-Documented, Methodology-as-Anticipated and Methodology-in-Action states proposed in Chapter 4, and provides examples of contingent and improvised tailoring transitions involving these three states.

This research cycle focuses on:

- Empirically validating the notion and utility of the methodology state classification scheme presented in Chapter 4;
- Analysing, examples of contingent tailoring transitions between an instantiation of the Methodology-as-Documented and the Methodology–as-Anticipated;
- Analysing, examples of contingent tailoring transitions between one instantiation of the Methodology-as-Anticipated and another;
- Analysing, examples of improvised tailoring transitions between one instantiation of the Methodology-as-Anticipated and another; and

- Analysing, examples of improvised tailoring transitions between an instantiation of the Methodology-as-Anticipated and the Methodology-in-Action.

This chapter addresses the research question: "*To what extent does the synthesised model of ISDM tailoring reflect contemporary practice of ISDM tailoring as conducted in large, commercial projects?*".

This chapter is structured as follows. The planning of this research cycle is described and the case project is introduced (Section 5.2). The data collection and analysis methods used within the cycle of research are described (Sections 5.3 and 5.4). The reflection activities undertaken are then reported (Section 5.5), focussing upon the interpretation of findings in terms of the model presented in Section 4.3.1 and the alignment of findings with literature. Finally, the implications for theory are presented (Section 5.6.1) and a partially validated form of the Conceptual Framework, part of applying the structured-case framework, is reported (Section 5.6.2).

5.2 Plan

5.2.1 The Selected Case

5.2.1.1 Case Project Origins

Section 3.6.2.1 described the selection of Sysco as the case organisation for the three cycles of research. It also introduced OzTel as the client organisation on behalf of whom Sysco was performing IS development. The first two cycles of research (covering the case project described in this chapter, and the one described in Chapter 6) examined ISDM tailoring on the Supply Chain Program (SCP).

As it was originally envisaged, the SCP consisted of three releases, during which time the supply chain logistics management function of OzTel would be outsourced (referred to as "transitioned") to Sysco. Efficiencies would be delivered to OzTel through changes to business processes, supported as far as possible, by automation of those processes (referred to as "transformation" of the business) – refer to the Glossary of Terms for a more detailed description of transitions and transformations. ISD is, in itself, a complex activity, however, the complexity inherent in ISD projects is further compounded in outsourcing projects due to the involvement of multiple parties in the implementation (Owen and Linger 2011, p.7).

The first release (subsequently identified as "SC1") identified within the contract was to provide very limited business capability. The project was to be largely responsible for defining, procuring, configuring and deploying the infrastructure, network connectivity and application software. These were to provide the platform for provision of additional capability to be delivered in future releases. In providing that limited business capability as part of the SC1 release, a legacy system used by OzTel for the management of repairs of spare parts ("MuSCLE") was to be decommissioned.

The platform provided by Release SC1 was then to be used by and extended by the SC2 and SC3 releases, which were intended to provide enhanced levels of business capability, additional efficiencies through automation of business processes and workflows, and the retirement of maintenance intensive legacy systems.

5.2.1.2 Case Project Objectives

From a Sysco perspective, the principal objective of the SC1 release was to analyse the requirements, and then define, procure, deploy and configure the necessary infrastructure (such as application servers, web servers, firewalls), network connectivity and application software which were to provide the platform for the provision of the required business capability to be delivered in this and future releases.

The key business capabilities and outcomes to be delivered were:

- Management of work orders for the repair of spare parts was to be transferred to Sysco from OzTel;
- Optimisation of the inventory of spare parts held in the centres responsible for the repair of spare parts to reduce the value of inventory; and
- Retirement of the existing MuSCLE application.

5.2.1.3 Case Project Stakeholders

Within the SC1 release, there were two principal stakeholder organisations, representing four groups of stakeholders:

1. Sysco Stakeholders

    a. Sysco Business Stakeholders

    Under the terms of the SCP contract, Sysco accepted responsibility for the management of the OzTel supply chain and logistics management functions and was required to deliver specified amounts of savings over the seven year life of the contract. In order to meet that contractual obligation for savings, Sysco needed to transform the business. A key contribution to that transformation was the automation of business processes.

b. Sysco IT Stakeholders

The Sysco IT Systems team were responsible for the design, development, test and delivery into production of the IT system. A key activity early in this development process was the definition of the methodology to be adopted. Sysco IT Systems team members were stakeholders.

2. OzTel Stakeholders

a. OzTel Business Stakeholders

Whilst the operation of OzTel's supply chain and logistics management functions was to be outsourced to Sysco as part of the SCP contract, OzTel retained a significant interest in the operation of those functions. This was because many sections of the OzTel organisation would be impacted adversely if those functions were unable to meet the needs of the business users. A small group of OzTel middle and senior management were identified who, whilst ostensibly responsible for overseeing the contract, in reality had little interest in the SC1 release, as they saw it as having little or no impact, beneficial or otherwise, on OzTel's operations. They took this view because the SC1 release provided limited business functionality, and instead, was a foundational release in the sense that it laid down the infrastructure, network connectivity, and application base to be built on in subsequent releases. As such, this group constituted a significant stakeholder cohort.

b. OzTel IT Stakeholders

Whilst Sysco was responsible for the design, development, test, and deployment of the SC1 release, the IT team within OzTel retained a significant interest in it because it needed to integrate with systems for which they were responsible. Within this team there were 4 key stakeholders:

- An executive with overall responsibility within OzTel for the delivery of the release;
- An OzTel Project Manager who monitored progress and compliance with the SCP contract. As part of his role, he was particularly interested in ensuring

that the methodology adopted enabled the quality assurance compliance obligations specified in that methodology to be met; and

- Two OzTel IT Architects who worked closely with their Sysco counterparts in the definition, review, and approval of requirements and design.

5.2.1.4 Case Project Environment

There were two key customer groups (the Sysco Business Operations Team, and the OzTel Business) involved in the elicitation, refinement and approval of requirements, however their interests differed.

A key emphasis of the Sysco Business Operations Team was on reducing the cost of delivering the supply chain and logistics management services to OzTel, to ensure that the contractually obligated savings could be delivered whilst enhancing the profitability of the SCP contract.

The principal interests of the OzTel Business, on the other hand, were in ensuring that the delivery of supply chain and logistics management services to OzTel continued without interruption, to the specified service levels, and with reduced cost. As a consequence, the OzTel Business was focussed on getting as much of the supply chain and logistics management processes automated as possible, including the integration of part ordering, pick up and delivery. Enabling such integration required the construction of a number of interfaces between various systems, driving up the cost, contrary to the objectives of the Sysco Business Operations Team.

5.2.2 Planned Data Collection

Planning in order to address the research question involved:

- Identifying opportunities for observation of tailoring of an ISDM at Sysco. Within the terminology of Sysco, this tailoring is undertaken at Method Adoption Workshops (MAWs) (see Section 4.2.3.1), which vary in their length and degree of formality. Observation of MAWs provided an opportunity to observe firsthand ISDM tailoring.
- Interviews with several of the key participants at the MAWs (such as the Method Exponent, Architects, and Project Managers) to explore areas of interest which emerged during the observation of the ISDM tailoring workshops or to clarify poorly-understood aspects of methodologies and their use in commercial contexts.

- Collecting documents generated during the MAW to build a more complete picture of the changes made to the ISDM throughout the tailoring process.

Using multiple methods of data collection enabled different views of ISDM tailoring to be captured and allowed for the development of a richer, deeper understanding of, and insight into, ISDM tailoring (Neuman 2003).

5.3 Data Collection

Data collection was undertaken consistent with the plan described above. The methods used for the collection, storage, and retrieval of data were described in detail in Sections 3.6.3 and 3.6.5. This section describes the methods of data collection employed specifically in this research cycle.

5.3.1 MAW Observation

A number of MAWs were conducted during the project, however, as discussed in Section 3.6.2.1, MAWs vary considerably in their length and formality. MAWs can vary from formal, face-to-face workshops involving many participants, to much less formal sessions involving a small number of participants such as the lead IT Architect and the Project Manager, or just the Method Exponent. There were no formal, multiple participant MAWs conducted as part of this case project.

The MAWs which were examined consisted of the following:

5.3.1.1 Single Participant MAWs

On this case project, the Method Exponent often undertook tailoring activities independently. Typically, MAWs of this type entailed defining minor changes to the ISDM, such as removing a work product, moving a work product from one phase to another, or changing the documented input dependencies of a particular work product. A total of 5 such single participant MAWs were observed and the documents produced were collected for analysis.

5.3.1.2 Informal Multiple Participant MAWs

MAWs of this type typically involved the Method Exponent and a small number of other participants (often limited to one or two key roles such as the lead IT Architect, or Program Manager) discussing how the ISDM should be tailored. MAWs of this sort were undertaken in an informal setting such as at the desk of one of the participants without the documentation, such as meeting minutes which would be kept in the case of a formal MAW. However, any documents generated during such MAWs were collected for subsequent analysis. Typical tailoring activities undertaken in MAWs of this type included the addition of a new work product to the tailored ISDM, removing a work product, moving a work product from one phase to another, or changing the documented input dependencies of a particular work product. In excess of 15 such informal, multiple participant MAWs were conducted in this form.

5.3.2 Interviews with MAW participants

Secondly, interviews were conducted with key participants in the MAWs. These interviews were recorded and transcribed. As soon as possible after the MAW (always within 24 hours), participants were interviewed using semi-structured interviewing techniques (see Table 10). The aim was to reflect on the workshop and to investigate events observed during the MAW. Follow up interviews were also arranged with MAW participants when required, to seek clarification of issues which emerged subsequent to the MAW. Note that Appendix D provides biographical details of MAW participants.

Table 10 – Table of Sources of Data in Research Cycle 1

<table>
<tr><th>Interviewee
(see biographical details in Appendix H)</th><th>Data Collected</th></tr>
<tr><td>PITA-1</td><td>Responses to questions relating to observations of actions taken, documents produced, or comments made during ISDM tailoring leading up to contract signing.</td></tr>
<tr><td>CITA-1</td><td>Responses to questions relating to observations of actions taken, documents produced, or comments made during ISDM tailoring sessions covering the SC1 release.</td></tr>
<tr><td>RITA-1</td><td rowspan="2">Responses to questions relating to observations of actions taken, documents produced, or comments made during ISDM tailoring sessions covering the SC1 release.</td></tr>
<tr><td>RITA-2</td></tr>
<tr><td>RPM-1</td><td>Responses to questions relating to observations of actions taken, documents produced, or comments made during ISDM tailoring sessions covering the SC1 release.</td></tr>
<tr><td>ME-6</td><td>Responses to questions covering tailoring of the ISDM for the SC1 release.</td></tr>
</table>

Attended/Participated in MAW but NOT interviewed	
OPM-2	Responses to questions relating to integration of the tailored ISDM with Oztel's needs. OPM-2 provided direction as to the needs of OzTel which needed to be taken into consideration in tailoring exercises, but was NOT interviewed.
TL-1	Responses to questions covering work products needed to be included in the tailored method to ensure test program was of sufficient quality. TL-1 was a participant in MAWs but was NOT interviewed.

5.3.3 Document Collection

Documents produced in the course of preparing for and executing the MAWs, included:

- MAW workbooks documenting the structure of the tailored ISDM (such as lifecycle phases, work products included in and excluded from each phase, along with a rationale for their inclusion/exclusion, dependencies between the work products), and diagrams depicting in greater detail the structure of the tailored ISDM and interdependencies between work products;
- Visio diagrams representing the structure and content of the ISDM;
- Word documents; and
- Email exchanges between key participants in the tailoring process.

More than 300 files, totalling more than 650 megabytes of electronic documents of the types listed above were collected.

5.4 Analyse Data

5.4.1 Methods of Data Analysis

5.4.1.1 MAW Observation and Interviews

Analysis of the notes taken in the course of observing the MAWs and transcripts of audio recordings of interviews with MAW participants was undertaken by comparing them against the key characteristics identified in CF_1 described in Section 4.3.1. The process adopted was to map observations documented in the notes against the key characteristics contained within CF_1. This included providing evidence to support the existence of the three discrete states in which an ISDM may exist (the "Methodology-as-Documented", "Methodology-as-Anticipated", and "Methodology-in-Action"), but also searching for potentially disconfirming evidence, including different or additional states. In addition, evidence to support or refute the different ways in which the transitions between and within these states (where tailoring events occurring in either a pro-active (contingent) manner, or a reactive (improvised) manner) can occur was also sought. Where interesting points within the MAWs were identified, which could not be mapped to any of these key characteristics, they were recorded for further examination during the reflection stage and for possible inclusion in a validated Conceptual Framework. An example of the notes taken and the method of analysis is presented in Appendix F.

5.4.1.2 Document Analysis

A large number of documents were collected during and after the MAWs, as described in Section 5.3.3. Given the nature of these documents (examples included Excel spreadsheets, PowerPoint presentations, Visio diagram, email messages) they were collected electronically. Not all were relevant to ISDM tailoring. The documents were reviewed to identify those of relevance to ISDM tailoring. As part of this process, a “Document Summary Form” was produced (see Appendix J) which recorded the key features of the documents.

This subset was further analysed to identify the nature of the changes being made to the ISDM from one instantiation to the next. Such changes included:

- Modifications to the structure of the ISDM – for example, adding phases to the ISDM; removing phases from, or merging phases within the ISDM; changing the sequencing of phases within the ISDM; and changing the names of phases.
- Modifications to the content of the ISDM – for example, adding additional work products; removing work products; relocating a work product from one phase in the ISDM to another.

These changes were recorded in a set of documents (see Appendix G for an example of the actual data captured) which also recorded the version of the documents under examination and the changes from the preceding version. Other documents included emailed exchanges between key participants in ISDM tailoring. Where possible, changes identified within the documents were linked to these emails or to statements from observations of the MAWs and participant interviews, in an attempt to identify the motivations for the changes being made.

5.4.2 Analysis Outcomes - Case Study Chronology

Release SC1 was the first release of three planned within the Supply Chain Program (SCP) of work. This release was intended to have minimal impact on the operations of OzTel, with only a small number of users in its Global Operations Centre having any direct interaction with the new system. However, as the project developed, it became clear that the release laid the foundation for subsequent releases by putting in place the necessary server, network and software infrastructure to support the SC1 release and subsequent releases.

Functionally, the SC1 release would allow OzTel to retire a legacy IT system (“MuSCLE”), resulting in elimination of the costs of its maintenance. It also allowed for the transfer of the management of repairs from a network of repair centres previously owned and operated by OzTel to a Sysco managed location in Melbourne and to a third party location in Sydney. This required the identification, construction and implementation of interfaces between the new system, centred around a Sysco asset management package (“Maximus”), and existing OzTel owned systems.

The release included a combination of the implementation of a package ("Maximus"), and development of custom code to implement the interfaces between the package and other systems. These characteristics influenced the tailoring of the methodology in a number of ways.

5.4.2.1 Development of the Methodology-as-Documented

The contract between Sysco and OzTel had been signed in December 2007 after many months of negotiation. Leading up to contract signing, a small multi-disciplinary team was assembled to undertake sufficient planning to enable reasonably firm estimates of schedule and cost to be put in place. As part of this process, a Methodology-as-Documented was selected from Sysco's library of development methodologies ("Delivery Processes" in Sysco terminology). Since the Sysco library of methodologies contains in excess of 80 delivery processes, selecting the "Methodology-as-Documented" required finding the delivery process which was the best fit for the type of project and for the features, influences and constraints known at that time.

Among the explicit influences and constraints which were taken into account in reaching this decision was the need to use the Maximus package as the core of the solution. PITA-1 advised that this contractual constraint existed because an evaluation of a number of potential packages based on the understanding of OzTel's business problem at this time resulted in Maximus representing the best fit. As a consequence, Sysco's "Packaged Software" delivery process was selected and thus represented the Methodology-as-Documented.

5.4.2.2 Development of the Initial Methodology-as-Anticipated

Having selected the Methodology-as-Documented, further tailoring then took place as the project proceeded. An internal mandate to apply Sysco's Quality Assurance Method ("QAM") on all complex Information Systems projects worth in excess of $5 million resulted in additional activities being introduced to the methodology as the initial Methodology-as-Anticipated was produced. At this time, before requirements elicitation and analysis had commenced, a further constraint on the methodology emerged. An OzTel Project Manager, OPM-2, informed Sysco that they expected Sysco's tailored methodology to align with their own internal methodology. The initial Methodology-as-Anticipated was then tailored further to accommodate this requirement.

Following contract signing in December 2007, work on the project began. The small, multi-disciplinary team which had been in place during the pre-contract signing period handed over to the Business Operations and IT Systems teams. These teams had been formed and were to be responsible for the business and IT transformations which would underpin the cost savings to be delivered to OzTel.

The approach taken was to conduct a transition of the operations of the supply chain business from OzTel to Sysco, followed by a transformation. During the transition phase, the supply chain business, previously operated by OzTel, was absorbed within Sysco. Some of the employees in the OzTel business were transitioned to Sysco or to third party employment, and continued to perform the same functions, in the same way as before. The intention was that, during the transition phase, the new Sysco management would acquire sufficient operational experience to enable them to define what their requirements were for the subsequent transformation of the business to deliver the expected business benefits. One point of note was that the transition and transformation, rather than being executed in a serial fashion, with the transition occurring first, were effectively run in parallel. This created problems in that when the IT Systems Team approached the Business Operations Team for the purposes of commencing the requirements elicitation process, they were rejected. The Business Operations Team leader commented that "*We don't even know how the business operates now, let alone how we want it to run*". This decision to execute the transition and transformation in parallel would have significant implications for tailoring, as will be discussed below (Section 5.4.2.5).

5.4.2.3 Development of Further Instances of Methodology-as-Anticipated

This initial Methodology-as-Anticipated was then subjected to further tailoring as the SC1 release continued. The Methodology-as-Anticipated was supplemented with additional work products drawn from the base Methodology-as-Documented based on needs identified following analysis work early in the project. This created new instances of the Methodology-as-Anticipated.

In addition to adding work products, work products within the Methodology-as-Anticipated were modified – for example, one work product, the "System Requirements Specification" was found not to meet its intended purpose. In a tailoring event, the "System Requirements Specification" (SRS) as defined in the Methodology-as-Documented, and retained in the Methodology-as-Anticipated, underwent significant modification to provide a document which met all of the needs at the appropriate point in time. (Note – in a subsequent tailoring event, the SRS work product was deleted from the Methodology-as-Anticipated completely.) Finally, some work products defined within the Methodology-as-Documented were deleted, because the reason for their inclusion in the first place could not be understood as the project progressed.

This situation arose because the initial methodology definition was undertaken by PITA-1, as part of the pre-contract signing period. Following the signing of the contract, PITA-1 had little direct involvement with the delivery of the program and, instead, responsibility for ongoing tailoring of the ISDM fell to ME-6 who was not privy to the background of many of the decisions previously made around adoption.

5.4.2.4 Methodology-as-Anticipated Scope Change

As development work proceeded, significant problems emerged due, in part, to the organisational structures in place on the project. There were four teams involved in the operations of the newly acquired business (Business Process and Solution, IT Systems, Business Operations, and Change Management), and in developing the new business processes and IT system.

However, up to this point, the scope of the methodology covered only the operations of the IT Systems team, despite them having significant dependencies on the other teams for aspects of their work. The contract to which the program was working made no distinction between the teams and up until this point they had tended to work in isolation of each other. At this point, ME-6 became concerned that unless the significant interdependencies which existed between them were identified and the Methodology-as-Anticipated modified to make explicit the touch points and areas of interdependency between the teams, the IT Systems team would again be unable to complete its work due to its dependencies not being met. For example, the IT solution needed to support the business processes which were being developed to deliver the contractually specified cost savings. Until this point, however, the operations of the Business Process and Solution team had been hidden from the operations of the IT Transformation team.

5.4.2.5 Development of the Methodology-in-Action

The final key tailoring which occurred was a direct result of the problem referred to previously, where the IT Systems team had attempted to start the requirements elicitation process with the Business Operations team, only to be rebuffed by them.

The reason for the lack of availability of requirements was touched on in Section 5.4.2.2 - the transition of the business OzTel operation to Sysco was being conducted in parallel with the transformation of the business. This meant that the newly installed Sysco management team were unable to provide quality and detailed input to the requirements gathering process. To further compound the problem, many of the OzTel subject matter experts were not transitioned to Sysco, so the level of subject matter expertise in the new Sysco operated organisation was very low. The consequence was that there were no requirements coming from within the Sysco operation upon which to base the IT transformation. Members of both the Business Operations team and the IT Systems team commented that the decision to run the transition and transformation in parallel was poorly considered and was the root cause of many of the subsequent problems experienced by both teams.

Notwithstanding this problem, there was a contractual obligation to deliver requirements and design documentation to OzTel by 02 July 2008. This obligation drove further modification of the Methodology-as-Anticipated to produce what Fitzgerald (1997) refers to as the “Methodology-in-Action”. In this case, a considered decision was taken to assume a design based on the capabilities of the Maximus package. In doing so, Sysco was cognisant of the risk that the proposed solution would not meet the needs of the Sysco Business, nor those of the end customer, and that additional re-work would be required to align the requirements with the needs of the business. It was also cognisant of the probability that the design would not align with the requirements. This decision resulted in significant change to the structure of the methodology as indicated by the yellow boxes in Figure 15.

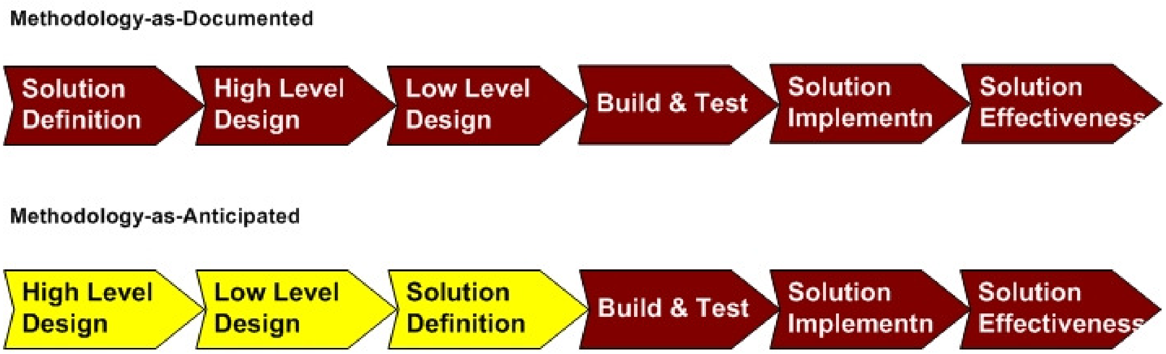

Figure 15 - Comparison of Macro Levels of M-a-D and M-a-A : Research Cycle 1

This tailoring event effectively represented the deferment of the Solution Definition phase of the Methodology-as-Anticipated to a later point in the lifecycle than originally envisaged. Conversely, this decision had the effect of displacing the High Level Design and Low Level Design phases of the Methodology-as-Anticipated to an earlier point in the methodology. In doing so, not all of the input dependencies required in these phases, principally in the area of requirements definition, had been met.

5.4.2.6 Ongoing Tailoring Events

As execution of the project continued, additional tailoring was undertaken.

These additional tailoring events occurred due to responses to emergent additional information about characteristics of, and constraints on, the project subsequent to the definition of the initial Methodology-as-Anticipated. This additional information included: the need to incorporate the QAM; the need to align the Methodology-as-Anticipated with the client's own delivery methodology; and schedule and budget constraints.

5.4.3 Analysis Outcomes - Key Tailoring Events

The project narrative presented in Section 5.4.2 identified five key tailoring events. These tailoring events are listed and described in detail in Table 11 below.

Table 11 - Summary of Observed Tailoring Events in Research Cycle 1

Tailoring Event Number	Nature of Tailoring Event
1	This tailoring event describes the development of the initial Methodology-as-Anticipated from Methodology-as-Documented. This drew on the selection of the appropriate Delivery Process on which to

	base the Methodology-as-Documented, supplemented by additional work products from other development methodologies in order to fill gaps which were identified in the base ISDM during an analysis of the contract and other information known at the time.
2	Early in the project lifecycle, the initial Methodology-as-Anticipated created in event 1 above was refined. Additional information about constraints came to light. Key to these was an internal Sysco mandate to integrate a specified Quality Assurance Method (QAM) onto the initial M-a-A. During a Single Participant MAW, ME-6 remarked that "*Sysco has an internal company policy that all projects worth more than $5 million must implement the QAM, in order to provide rigour around the development processes. The main impact on the method, is to incorporate QA gates at key lifecycle points – you know, at the end of lifecycle phases*". In effect, the impact was to ADD these gates, without impacting further on the emerging ISDM. In addition, since there was to be extensive engagement with the customer, the developing methodology was aligned with the customer's own methodology. In a subsequent Single Participant MAW, ME-6 commented that "*We really need to work closely with OzTel here, because we're integrating lots of stuff into their environment, plus, we need them to sign things off. Making our method as closely aligned with theirs removes one obstacle to that.*" He further commented that "*In reality it isn't hard to do, because OzTel's method was based on ours*".
3	This tailoring event resulted in further refinement of the Methodology-as-Anticipated. This refinement took various forms, including: • Adding work products from the base Methodology-as-Documented, or from other Delivery Processes based on a need identified following analysis work early in the project. ME-6 for example, identified early in the project that one of the key work products produced by the Maximus team was a Functional Specification. He commented that "*The Functional Specification is like the architecture of the package. It documents what it*

	should do, identifies which of its modules will implement the functionality and describes at a high level, its integrations. It is key, and really does have to be produced". • Modifying existing work products – for example, one identified work product, the "System Requirements Specification" was found not to completely meet its intended purpose at the expected point in the lifecycle where it was to be produced. For example, RITA-1 became aware that the System Requirements Specification (SRS) document was lacking content around interface requirements which were necessary. He commented that "*This project is a package implementation, sure, but it's really a package being glued to a bunch of other systems in Sysco and OzTel by a bunch of integrations. Making sure we understand those requirements is important. The SRS as it exists doesn't provide that level of knowledge*". In an example of tailoring, the "System Requirements Specification" (SRS) as defined in the base ISDM underwent significant modification to provide a document which met all of the needs at the appropriate point in time. • Removing defined work products because the reason for their inclusion in the first place could not be understood
4	The result of this tailoring event was to broaden the coverage of the Methodology-as-Anticipated. The Methodology-as-Anticipated at this point in time only covered the operations of the IT Systems team. It became apparent that there were two or three other streams of activity whose operations had touch points with the IT Systems team. The disconnect between these teams was identified by the Method Exponent, who found that members of the IT Systems team were unable to progress their work because previously unidentified dependencies had not been met. The methodology was tailored to make explicit the touch points and areas of interdependency between the teams. For example, the IT solution

	needed to support the business processes which were being developed to deliver the contractually specified cost savings. Up until this point, however, the operations of the Business Process and Solution team had been hidden from the operations of the IT Systems team. During a Single Participant MAW, ME-6 made the observation that "*This is going to dramatically increase the number of work products and client deliverables. For example, we now include the Communications Strategy/Plan and Materials, and their inputs. Likewise, the Training Strategy/Needs Analysis and Training Materials and all of their input dependencies are now included*".
5	This tailoring event was driven by an inability to elicit requirements from the Business Operations team. A consequence of executing a transition and transformation in parallel, was that those operating the business had insufficient knowledge of the "as is" state of the business, let alone what their desired "to be" state was. This lack of requirements (and a contractual obligation to deliver key documentation by a specified date) meant that enforcing the Methodology-as-Anticipated by mandating the preparation and sign off of a Business Requirements Document would have resulted in failure to meet the contractual obligations. The Methodology-as-Anticipated was thus further tailored by assuming a design based on the out-of-the-box capabilities of the Maximus package. RITA-1 rationalised this decision when he said "*Sysco were going to be hit with significant contractual penalties if we didn't get the architecture done by 02 August. But we had no requirements. The only thing we could do, especially since this release was delivering basic functional capability, was to assume a design based on the out-of-the-box capabilities of Maximus. I know it's like putting the cart before the horse, but commercial realities have driven this one*". The result of this decision was effectively to shift the High Level Design and Low Level Design phases of the Methodology-as-Anticipated to an earlier point in the methodology (see Figure 15). In effect, this "broke" the methodology in that it required work in one phase later in the lifecycle to be performed before its dependencies earlier in the lifecycle were in place. This

	decision drew on the experience of the team in the problem domain and in the package being implemented, to enable them to meet the high level contractual obligations.

5.4.4 Analysis Outcomes - Initial Classifications

Each tailoring event changes the methodology to a new, tailored state. The three possible states in which the methodology may exist are conjectured to be the Methodology-as-Documented, the Methodology-as-Anticipated, and the Methodology-in-Action.

The changes in state during these tailoring events (referred to as "state transitions") are conjectured to occur in one of two ways:

- Contingent tailoring
- Improvised tailoring

Contingent tailoring as defined in Section 4.3.1.2 is ISDM modification which takes into account these "contingency variables" to produce a methodology which is a better “fit” to the project characteristics. The development of the initial Methodology-as-Anticipated from the Methodology-as-Documented is an example of this form of tailoring. This tailoring involved the selection of additional work products with which to supplement the selected Methodology-as-Documented, based on the understanding of the requirements (contractual, business and IT) as they existed at that point in time. Such tailoring is proactive in nature, in that it is based on an understanding of the project characteristics as they are perceived at the time.

This initial Methodology-as-Anticipated was then subjected to further tailoring. Additional instances of tailoring occurred as additional information about characteristics and constraints of the project emerged subsequent to the definition of the initial Methodology-as-Anticipated. This additional information included the need to incorporate the QAM; the need to align the Methodology-as-Anticipated with the client’s own delivery methodology; and schedule and budget constraints.

These subsequent tailorings were proactive responses to the understanding of the project’s features at that point in time. Consequently, these tailoring events are referred to as applications of contingent tailoring. In particular, these included the need to make assumptions about the design, due to schedule constraints.

Other tailoring events represented examples of improvised tailoring. Improvised tailoring as defined in Section 4.3.1.2 is ISDM modification in response to emergent changes in one or more project conditions during the execution of a project. The emphasis is on leveraging the experience, opportunism, flexibility, and adaptability of the practitioner to tailor the ISDM to suit the characteristics of the situation at the moment of action (rather than it being planned ahead as is the case for contingent tailoring).

The initial and final states and state transitions for the key tailoring events identified in Table 11 above are classified in Table 12.

Table 12 – Classification of States and Transition Type in Research Cycle 1

Tailoring Event Number	Methodology States		Form of Tailoring	Classification of Tailoring Event
	Initial State	Final State		
1	Methodology-as-Documented	Methodology-as-Anticipated	Contingent	This tailoring event drew on the selection of the appropriate Delivery Process on which to base the Methodology-as-Documented, (supplemented by additional work products from other development methodologies) based on an analysis of the contract and other information known at the time. This was a pro-active, considered tailoring event in response to known, or planned for conditions. In explaining how the base Delivery Process was selected, CITA-1 commented that "*I knew what was being asked of us, and so I had a good idea pretty early on which Delivery Process to choose*". This is therefore categorised as an instance of contingent tailoring.
2	Methodology-as-Anticipated	Methodology-as-Anticipated	Contingent	After defining the initial Methodology-as-Anticipated, additional information about constraints became available, such as an internal Sysco mandate to integrate the Quality Assurance Method (QAM) into the initial M-a-A. In addition, since there was to be extensive engagement with

				the customer, the developing methodology was aligned with the customer's own methodology. Whilst these additional constraints were emergent, as development work had not commenced, there was time available for the Method Exponent to make a pro-active response to these constraints. Consequently, this transition is categorised as a contingent form of tailoring.
3	Methodology-as-Anticipated	Methodology-as-Anticipated	Improvised	Following the commencement of work on the project, additional tailorings resulted in further refinement of the Methodology-as-Anticipated. These tailorings (described in Table 11 above) were responses to a number of emergent features of the project, including: • Identifying the need for additional work products due to gaps in the Methodology-as-Anticipated; • In-situ use of work products from the Methodology highlighting that one or more of them did not completely meet its intended purpose; and • Questions being raised about why particular work products were to be developed, because the reason for their inclusion in the first place could not be

				understood. These events occurred during the course of work on the project and were reactive responses to the issues which emerged, and drew on the knowledge and experience of the Method Exponent. As such this transition is categorised as an improvised form of tailoring.
4	Methodology-as-Anticipated	Methodology-as-Anticipated	Improvised	Significant issues which emerged in aligning the work of the three teams (see Section 5.3) resulted in further changes to the Methodology-as-Anticipated to ensure alignment of the Business Process and Solution; Business Operations; Change Management; and IT Systems teams and to ensure that the significant interdependencies which existed between them were met. These events occurred during the course of work on the project and were reactive responses to the issues which emerged. The tailoring which occurred in response to these events drew on the knowledge and experience of the Method Exponent and as such this transition is categorised as an improvised form of tailoring.
5	Methodology-as-Anticipated	Methodology-in-Action	Improvised	The decision to execute a transition and transformation in parallel, led to those operating the business having

				insufficient knowledge of the "as is" state of the business, and an inability to express what their desired "to be" state was. The resulting lack of requirements and contractual constraints drove further tailoring, assuming a design based on the out-of-the-box capabilities of the Maximus package. This decision was not opportunistic but drew on the experience of the team in the problem domain and in the package being implemented, to enable them to meet the high level contractual obligations and as such, it represents an improvised tailoring event.

Figure 16 identifies the key tailoring events described in detail in Table 12 above, and, for each event, identifies the type of transition between states of the methodology.

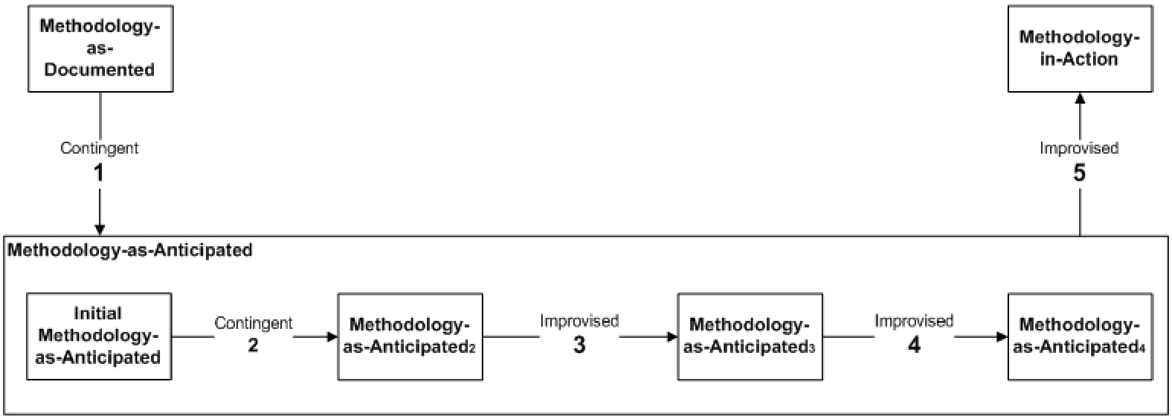

Figure 16 - Key ISDM Tailoring Events : Research Cycle 1

5.5 Reflect

The reflection stage of the Structured-Case framework is intended to lessen the tendency to only note confirmatory evidence (Babbie 2010). It provides a formal opportunity for reflection and critical evaluation of the research process (including methods for collection and analysis of data); the outcomes of the data analysis (including evaluating the emerging themes, challenging interpretations and seeking disconfirming evidence); building theory and critically reviewing any theory built; and modifying the Conceptual Framework to accommodate the theory built during this cycle of research.

In this cycle of research, reflection centred on validating CF_1 presented in Section 4.3.1. This validation took the form of drawing evidence from the case to support the key constructs proposed in CF_1, those being:

- An ISDM exists in three states: Methodology-as-Documented, Methodology-as-Anticipated and Methodology-in-Action
- Transitions between states can occur in one of two fundamentally different ways:
    - Contingent tailoring
    - Improvised tailoring

5.5.1 Reflection on Utility of Alternative Models

As remarked above, the reflection stage of the Structured-Case framework is intended to lessen the tendency to only note confirmatory evidence. In this section, a brief assessment is made of whether the observed ISDM tailoring events could have been interpreted using the alternative models proposed in Section 2.5, or whether there were events observed which did not fit the Initial Conceptual Framework proposed in Section 4.3.1.

The four tailoring events observed in this cycle of research could have been interpreted using Appropriation as the analytical lens. However, such analysis would have been at such a high level as to provide no meaningful information as to the process of tailoring. In effect, the complex process of ISDM tailoring revealed in this case would have been entirely subsumed within level 2 of the Model of Technology of Appropriation (Carroll, Howard et al. 2002, p.53) and not provided insight into ISDM tailoring.

Opportunism was identified in Section 2.5 as another alternative construct with which to view ISDM tailoring. Of the five tailoring events identified in this case, three of them (events 3 to 5 inclusive in Table 12) could, by their nature, have been analysed using opportunism as the lens. However, had this been done, it would have provided only a partial fit with the observed events, as key to each of them, was the leveraging of the practitioners' knowledge and experience. Such a feature is not a characteristic of opportunism, and as such, would have been lost.

However, the events described in Section 5.4.4 could not be interpreted using Situated Action as the analytic lens, at least not in the context of the emerging model of ISDM tailoring. The principal reason for this is that Situated Action is concerned more with understanding why particular actions are being taken, whereas the focus of this study is on developing an understanding of what happens when ISDM tailoring occurs. In addition, in change viewed using the lens of Situated Action, the development and execution of a response may be separated in time, whereas in an improvised response, the development and execution of a response are simultaneous, or very tightly connected in a temporal sense. In the current cycle of research, a key feature of those events ultimately categorised as "Improvised" was the tight coupling between the stimulus for change, and the change itself.

Finally, all five key tailoring events described in Section 5.4.4 were able to be categorised using the constructs contained within CF_1. No tailoring events were observed in this case which did not fit the emerging model of ISDM tailoring.

In summary, this cycle of research provided evidence to support the existence of four of the 18 transitions proposed in CF_1 (Section 5.4.4). There was no evidence drawn from the case to support the identification of additional states or types of transitions beyond those proposed in CF_1. The partially validated Conceptual Framework is presented in Section 5.6.2.

5.5.2 Summary of the Application of Structured-Case

Each cycle of research undertaken within the structured-case framework includes a planning phase, a data collection phase, and data analysis phase, and a reflection stage (see Section 3.4.2.1) (Carroll and Swatman 2000). Appendix L summarises the major activities undertaken within each of the structured-case phases.

5.6 Discussion

5.6.1 Implications for Theory

5.6.1.1 Identification of States of ISDM

Previous research into ISDMs conceptualised methodologies as existing in just two states: the initial, documented form (the Methodology-as-Documented (M-a-D)); and the final, tailored, in-use form (Methodology-in-Action (M-i-A)), (Fitzgerald 1997).

The Initial Conceptual Framework (CF_1) presented in this research (see Section 4.3.1), based on the research theme "In what ways are ISDMs tailored?", an extensive literature review, expert opinion (obtained through interviews with methodology practitioners, and two workshops) and the researcher's own theoretical foundations, proposed a third state, intermediate between the two: the Methodology-as-Anticipated (M-a-A).

Observations from this cycle of research have provided evidence to support this construct. It was observed that the ISDM used on the case project underwent multiple instances of tailoring prior to its execution on the project. These instantiations of the M-a-A were not executed, but represented discrete steps in the methodology tailoring and deployment process. The nature of the differences between each of the instantiations varied. They ranged from changes to the high level structure of the Methodology-as-Anticipated, such as changes to the sequencing of phases, to the addition and deletion of work products from the preceding instantiation.

5.6.1.2 Identification of Transitions Between States of ISDM

Studies of ISDM tailoring to date have not described in detail the transition between the initial state of an ISDM and its final state.

The Initial Conceptual Framework (CF_1) presented in this research (see Section 4.3.1), proposed that the transitions between ISDM states could be categorised as two types:

- a **contingent** tailoring transition, where the nature of the tailoring is a pro-active response to known or perceived project conditions; and

- an **improvised** tailoring transition, where the tailoring which the ISDM is subjected to is reactive, in response to emerging project conditions.

During the course of this research cycle, we have observed transitions of both types, as previously reported in Section 5.4.4. Early in the project lifecycle, with little information known about the project, tailoring occurred pro-actively in a contingent way, based largely on a set of documented assumptions about the scope, schedule and budget of the project.

Later in the project, as additional requirements and constraints emerged, tailoring was undertaken reactively, in an improvised way. These improvisations drew on the flexibility, knowledge and experience of the methodology exponent and project team.

5.6.2 Validating the Conceptual Framework

Key findings in each structured-case research cycle are encapsulated in a conceptual framework which evolves throughout the research. This framework captures the insights drawn from each cycle of research, and also seeds the next cycle of research.

In this cycle of research, four of the 18 transitions proposed in CF_1 were observed. These were:

- Contingent tailoring transition between the Methodology-as-Documented and the Methodology-as-Anticipated states;
- Recursive contingent tailoring transition of the Methodology-as-Anticipated state;
- Recursive improvised tailoring transition of the Methodology-as-Anticipated state; and
- Improvised tailoring transition between the Methodology-as-Anticipated and the Methodology-in-Action states.

These findings are captured in an emerging model of ISDM tailoring on large, complex, commercial Information Systems Projects. The partially validated Conceptual Framework (CF_2) is shown in Figure 17.

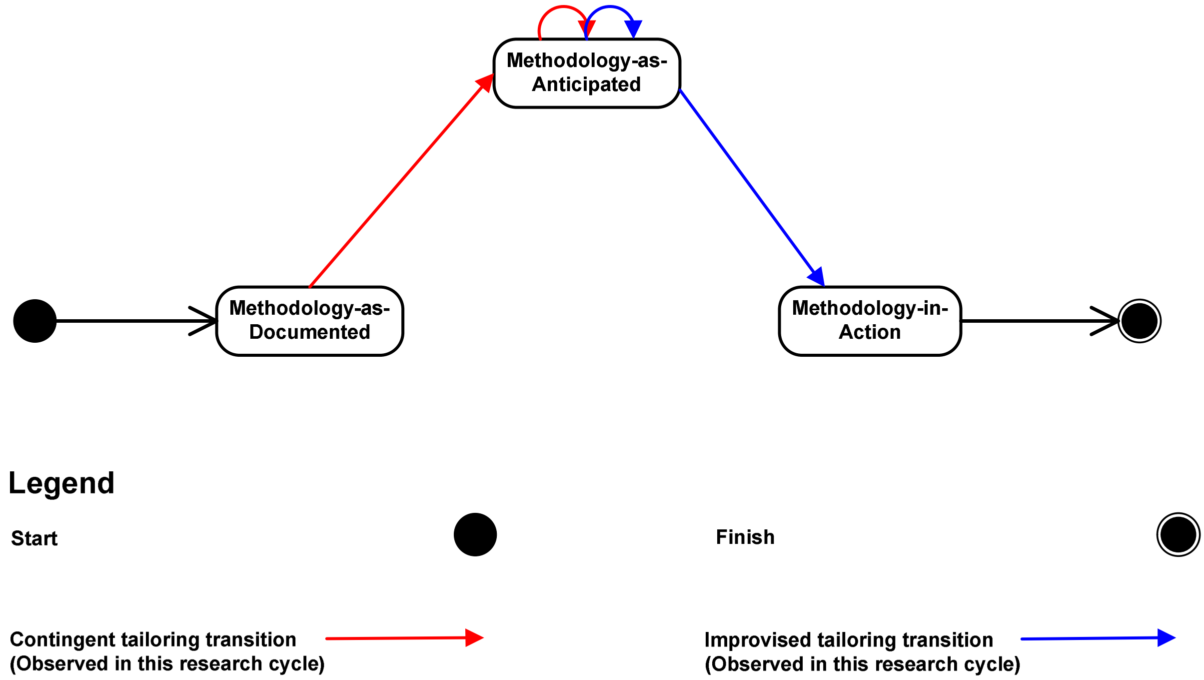

Figure 17 – Partially Validated Conceptual Framework (CF_2)

This cycle of research validated the key conceptualisations of Methodology-as-Documented, Methodology-as-Anticipated, and Methodology-in-Action, and the differentiation between contingent and improvised tailoring.

This cycle of research also validated a number of the ISDM state transitions identified in the Initial Conceptual Framework. In Figure 17, the solid lines between ISDM states represent transitions for which observational evidence was obtained during the case. For example, we observed a contingent transition from the Methodology-as-Documented to the Methodology-as-Anticipated, and improvised transitions between the Methodology-as-Anticipated and the Methodology-in-Action. These transitions were described in detail in Section 5.4.

Multiple instances of tailoring of the Methodology-as-Anticipated to produce further instantiations of the Methodology-as-Anticipated were observed, with these instantiations being the result of both contingent and improvised transitions.

Many of the transitions proposed in the Initial Conceptual Framework however, were not observed. Thus, whilst CF_1 proposed, for example, both contingent and improvised transitions from the Methodology-in-Action back to the Methodology-as-Documented, no evidence was observed in this cycle of research to support this.

5.7 Chapter Summary

This research cycle investigated the tailoring of an ISDM on a large, complex, commercial Information Systems project. A research plan was prepared (Section 5.2). A variety of types of data were collected, including method documents, notes of observations of MAWs, and interviews with ISDM tailoring participants (Section 5.3).

The observation of MAWs (Section 5.3) provided a vehicle for the researcher to observe interactions between the individuals that might provide insights into factors that might influence ISDM tailoring. Subsequent interviews (Section 5.3) provided opportunities for more in-depth investigation of interesting themes which emerged during the MAWs. Analysis of collected documents (Section 5.4) allowed the researcher to identify the nature of the various instances of tailoring and to connect them to motivations for the tailoring events captured in email exchanges between participants or in the interviews.

The conceptual framework initially proposed in Section 4.3.1 has been partially validated, taking into account observations in this research cycle (Section 5.5). Essential constructs of CF_1 including the three proposed states in which an ISDM can exist, and the two types of transitions between these states, have been observed (Section 5.6). Only a subset of the many transitions identified in CF_1 were observed in this cycle of research, however, and the search for observational evidence to support the additional transitions will be the focus of subsequent research cycles. The partially validated Conceptual Framework (CF_2) addresses the second research question, "*To what extent does the synthesised model of ISDM tailoring reflect contemporary practice of ISDM tailoring as conducted in large, commercial projects?*".

This research cycle has:

- empirically tested the notion and utility of the methodology state classification scheme presented in Chapter 4;
- analysed examples of contingent tailoring transitions between an instantiation of the Methodology-as-Documented and the Methodology–as-Anticipated;
- analysed examples of contingent tailoring transitions between one instantiation of the Methodology-as-Anticipated and another;
- analysed examples of improvised tailoring transitions between one instantiation of the Methodology-as-Anticipated and another; and
- analysed examples of improvised tailoring transitions between an instantiation of the Methodology-as-Anticipated and the Methodology-in-Action.

6 RESEARCH CYCLE 2 – SUPPLY CHAIN PROGRAM SECOND RELEASE

6.1 Introduction

This chapter describes the second cycle of research, presents results from the second of three case studies, and extends the Conceptual Framework introduced in Chapter 4 and subsequently validated, in part, in Chapter 5. It examines ISDM tailoring on a second project within the case organisation introduced in Section 3.6.2.1. Several of the transitions between the ISDM states proposed in the Initial Conceptual Framework (CF_1) presented in Section 4.3.1 were observed in the first cycle of research. This cycle of research uncovers additional transitions, observed to occur between ISDM states proposed in CF_1.

This cycle of research focuses on:

- Validating constructs which were proposed in CF_1, that were not observed in the first cycle of research;
- Analysing for the first time, examples of contingent tailoring transitions between one instantiation of the Methodology-as-Documented and another;
- Analysing for the first time, examples of contingent tailoring transitions between an instantiation of the Methodology-as-Anticipated and the Methodology-as-Documented;
- Analysing for the first time, examples of contingent tailoring transitions between an instantiation of the Methodology-as-Documented and the Methodology-in-Action;
- Analysing for the first time, examples of improvised tailoring transitions between one instantiation of the Methodology-in-Action and another; and
- Analysing for the first time, examples of contingent tailoring transitions between an instantiation of the Methodology-in-Action and the Methodology-as-Documented.

This chapter is structured as follows. The case project examined in this cycle of research is described and the data collection is planned in Section 6.2. The methods used for data collection and analysis within the Structured-Case research strategy in this cycle of research are described in Section 6.3. The findings from the case are reported (Section 6.4) and interpretation of the collected data and observations against CF_1 (presented in Section 4.3.1

and the partially validated Conceptual Framework (CF_2) presented in Section 5.6.2) are presented (Sections 6.5 and 6.6). Section 6.5.4 presents the Conceptual Framework reflecting further observation based validation, as required when applying the Structured-Case research strategy.

6.2 Plan

6.2.1 The Selected Case

6.2.1.1 Case Project Origins

The original vision for the Supply Chain Program (SCP) described in Section 5.2 included only three releases: SC1, SC2 and SC3. Additional releases, SC4 and SC5, were added later.

As development of the SC1 release progressed throughout 2008, and as the SC4 release came into being from approximately August 2008, costs on the program began to increase significantly. As a consequence, a decision was made in November/December 2008 by Sysco management that the SC2 and SC3 releases would be merged into a single "mega-release" with 2 drops, referred to as SC3.1 and SC3.2 respectively. The release approach at this time thus consisted of:

- Release SC1;
- Release SC4; and
- Release SC3, consisting of two "drops", SC3.1 and SC3.2

This represented a significant departure from the original release plan as specified in the contract, and placed considerable strain on the commercial relationship between Sysco and OzTel.

Despite these changes, costs continued to rise on the program, largely because the SC4 release was encountering significant problems whilst undergoing Systems Integration Test, resulting in additional effort in testing and defect remediation beyond that budgeted and scheduled.

Further extensive replanning then took place from May 2009, for a period in excess of 4 months, as management attempted to formulate a definition of scope which was acceptable to OzTel and which was deliverable at a reasonable cost to Sysco. At this point RITA-2, one of the architects on the program commented, that it felt as though he "*...did nothing else but replan over and over again*".

By mid-2009, this replanning effort had led to a new approach which recognised that the key driver behind the reorganised program should be business benefit to OzTel. The capabilities to be delivered were broken up into a series of 12 functional "building blocks" which were then re-bundled into releases.

As a result of this replanning, three additional releases were identified:

- SC5 – which covered the original SC3.1 scope, which was tightly coupled to the OzTel TeleTransform release due in January 2010, and which formed the basis for this cycle of research;
- SC6 – providing a replacement for ConMat, an existing OzTel contractor and materials management system. Like the SC4 release, which was responsible for the problems which the program was experiencing, this release included items NOT in the contract. The SC5-SC6 Release Manager responsible for the SC5-SC6 release commented at the time that he was "*…not clear why this work is being done*"; and
- SC7 – which covered everything else, including the "old" SC2 scope.

The changes in release structure are represented schematically in Figure 18.

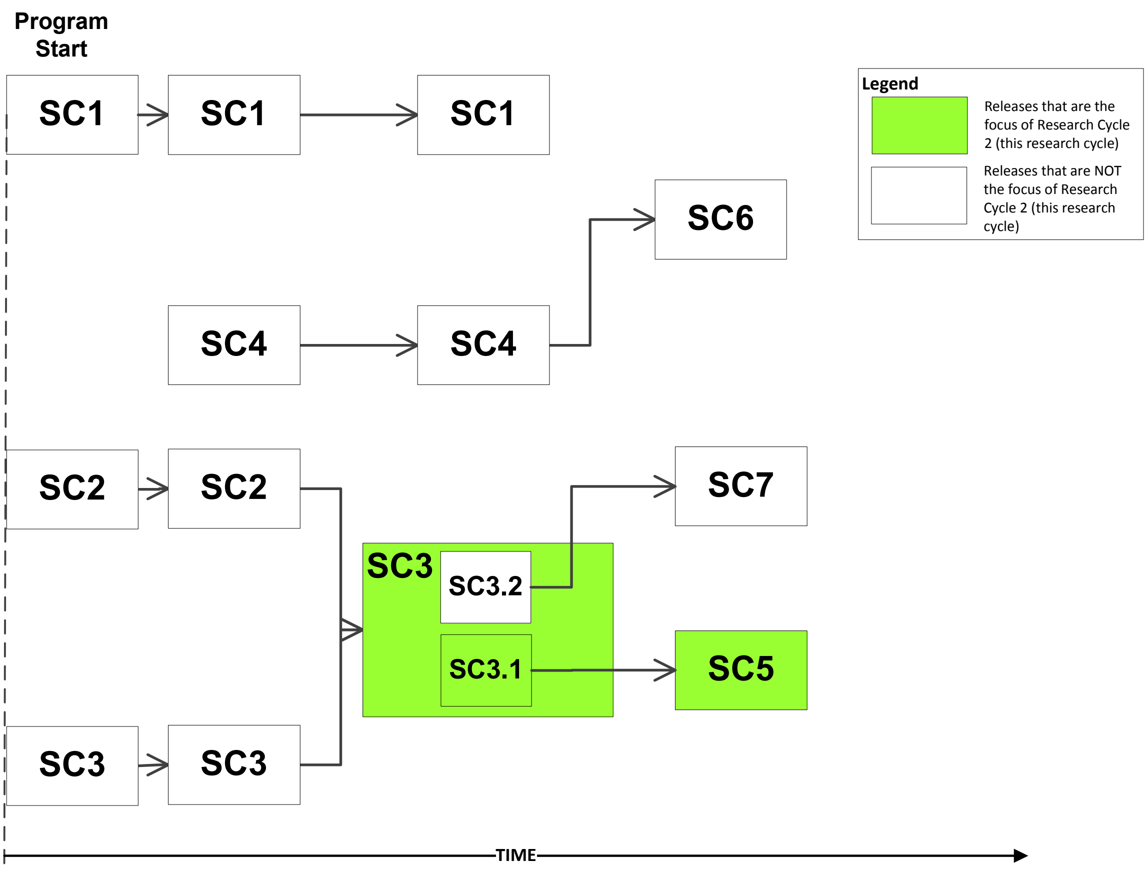

Figure 18 - Changes in Supply Chain Program Release Structure : Research Cycle 2

6.2.1.2 Case Project Objectives

Functionally, the SC3/SC3.1/SC5 release was to provide additional capability beyond that provided in the only release delivered up to this point – SC1. Specifically, it was to provide functionality that enabled the integration of Sysco's systems for procurement management with OzTel's systems for management of network incidents and change management. This integration would enable the electronic request of Spare Parts managed by Sysco which were needed to repair faults within OzTel's telecommunications network equipment, and would provide electronic status updates for these requests.

6.2.1.3 Case Project Stakeholders

The SC3/SC3.1/SC5 release, like the rest of the Supply Chain Program, had diverse stakeholders. Section 5.2.1.3 discussed the stakeholder groups specific to the first cycle of research. Many of those stakeholders are common to the SC3/SC3.1/SC5 release.

They were drawn from two principal stakeholder organisations, representing four discrete groups of stakeholders.

1. Sysco Stakeholders
    a. Sysco Business Stakeholders
    b. Sysco IT Stakeholders
2. OzTel Stakeholders
    a. OzTel Business Stakeholders
    b. Sysco IT Stakeholders

Detailed descriptions of each of these stakeholder groups can be found in Section 5.2.1.3.

In this case, there was another significant stakeholder relevant to this project, the management team for the OzTel Transformation program. At the time that development of Release SC5 was in progress, the OzTel organisation was part way through a major transformation, the "TeleTransform" program (see Section 7.2.1.1 for details). This transformation was driven by a desire to rationalise the number of IT systems in existence within the organisation in order to: reduce licence and maintenance costs; automate key business processes; and provide a broader range of "self serve" business services to the customer.

The size and cost of the TeleTransform program dictated that all other IT development projects were required to fit in with the transformation program's needs, including requirements for the construction of interfaces. More importantly, the transformation program would dictate when these subordinate development projects would be required to be ready for testing and deployment. As a consequence, the management team of the transformation program was a key stakeholder in the SC5 project.

6.2.1.4 Case Project Environment

In the preceding section, the TeleTransform program was identified as a significant stakeholder within the SC3/SC3.1/SC5 project and it was explained that the size, complexity and importance of this project to OzTel meant that all other IT projects within OzTel were subordinate to its needs. In practical terms, this meant that the development effort required to deliver the release SC3/SC3.1/SC5 capabilities were timeboxed according to the TeleTransform delivery schedule.

Initial attempts at developing a schedule for the delivery of Release SC3/SC3.1/SC5 took a "bottom up" approach. In this approach, the individual teams responsible for the creation of the work products and deliverables each defined the time required for their work, and this was then integrated into a project schedule. However, this approach showed that delivery would occur some two months past the time when the TeleTransform program required the SC3/SC3.1/SC5 inputs.

As a consequence, this drove a "top down" replanning effort, in which the end date was fixed, and the time available for the development of relevant work products and deliverables was reverse engineered. Despite much objection from the IT Systems team, management directed that this plan be adopted.

This direction was motivated by the fact that Sysco had not been able to deliver anything to OzTel since December 2008 when the SC1 release went into production. Moreover, the abandoning of the SC4 release had caused OzTel to lose confidence in Sysco. Sysco management were therefore anxious to redeem themselves within OzTel by ensuring delivery in line with the TeleTransform program's dates.

A key decision taken during this time was to adopt a SCRUM based “Agile” methodology for the SC3.1 release. It should be noted that there was little or no experience within the SC3.1 project team in the use of such methodologies. This is discussed further in subsequent sections of this chapter (see Sections 6.3.1 and 6.4.2.1).

6.2.2 Planned Data Collection

The purpose of the second cycle of research was similar to the first, in that it sought to find confirming and dis-confirming evidence for the constructs proposed in CF_1 – namely the three states in which an ISDM can exist, and the different types of transitions between these states. Further, a number of transitions between states were not observed in the first research cycle. Research cycle two was planned to investigate these gaps.

Planned data collection focused on the following:

- Observing the MAWs in which ISDM tailoring was to occur on the case project. By observing MAWs, ISDM tailoring was witnessed firsthand and an understanding of the factors which influence the tailoring process was further developed;
- Conducting interviews with key participants in the MAWs (including the Method Exponent, Architects, and Project Managers) to explore areas of interest which emerged during the observation of the MAWs or to clarify poorly-understood aspects of methodologies and their use in commercial contexts;
- Collecting documents generated prior to, during, and subsequent to the MAWs to identify the changes made to the ISDM throughout the tailoring process.

6.3 Data Collection

6.3.1 Observation of Method Training

In Section 6.2, the decision to adopt a SCRUM based "Agile" methodology for the SC3.1 release was introduced, as was the lack of experience within the SC3.1 project team in the use of such methods. The action taken by release management to address this lack of experience was to engage persons experienced in the delivery of "Agile" methodology training to present training courses to the entire SC3.1 team, which at this point consisted of approximately 65 people.

These training sessions ran for 15 hours over two days and introduced the project team to the terminology and key concepts of the selected "Agile" approach. The training materials used in this course were collected for subsequent analysis.

Observation of the training sessions took place principally to develop an understanding of the principles, terminology and key concepts of the approach in order to provide context to subsequent data collection and analysis activities.

6.3.2 MAW Observation

Within the Sysco methodology, a Method Adoption Workshop (MAW) is a critical element in the tailoring of a selected delivery process (see Section 5.3.1).

In the SC3/SC3.1/SC5 release, eight MAWs were observed. None of these were formal MAWs – all consisted of informal sessions, either with the Method Exponent and/or the Release Manager and/or the lead IT Architect (three MAWs); or the Method Exponent on his own (five MAWs).

The MAWs with the Release Manager were recorded and subsequently transcribed for analysis. During the MAW, notes were taken of points of interest which were then raised with the participants in interviews conducted after the MAW (see section below).

In this cycle of research, as in that described in Chapter 5, the researcher was a member of the development team. However, the researcher's influence on tailoring of the ISDM was minimal.

6.3.3 Interviews with MAW participants

Immediately after each of the informal, multiple-participant MAWs, participants from the MAW were interviewed. These interviews were conducted using two sources to guide the interviews:

- A semi-structured interview guide which had been developed following the execution of interviews with MAW participants in the first research cycle, which was described in Chapter 5. A sample of the guide is to be found in Appendix A.
- Points of interest which were recorded during the observation of the MAWs

These interviews allowed for reflection on the MAW itself and provided opportunities for investigation into events noted during the MAW which had the potential to add insight into ISDM tailoring.

These interviews were recorded for subsequent transcription and analysis.

The Method Exponent (ME-6) was interviewed three times. The Release Manager (RPM-2), who participated in one of the MAWs, was interviewed at the conclusion of that MAW whilst the Release Architect (RITA-2), who was involved in two of the MAWs, was interviewed twice. Table 13 lists the MAW participant interviews, and additional stakeholders who were not interviewed. Note that Appendix D provides biographical details of MAW participants.

Table 13 - Table of Sources of Data in Research Cycle 2

Interviewee **(see biographical details in Appendix H)**	**Data Collected**
ME-6	Responses to questions relating to observations of actions taken, documents produced, or comments made as part of his responsibilities for ISDM tailoring covering SC3/SC3.1/SC5 release, and the broader program, with a specific emphasis on ensuring all contractual obligations are met by structuring the work breakdown structure appropriately. Artefacts produced prior to, during, and subsequent to the tailoring session.
RITA-2	Responses to questions relating to observations of actions taken, documents produced, or comments made during ISDM tailoring sessions covering the SC3/SC3.1/SC5 release, with a specific emphasis on structure and work products from an architectural perspective. Documents produced prior to, during, and subsequent to the tailoring session.
RPM-2	Responses to questions relating to observations of actions taken, Documents produced, or comments made during ISDM tailoring sessions covering the SC3/SC3.1/SC5 release, with a specific emphasis on structure and work products from a project management perspective. Documents produced prior to, during, and subsequent to the tailoring session.
Attended/Participated in MAW but NOT interviewed	
BSH-1	OzTel executive stakeholder who negotiated the delivery of another release, SC4, which was not explicitly included within the contract. This stakeholder was NOT interviewed.

There were no formal, multiple participant MAWs conducted as part of this case project.

6.3.4 Interviews with Release Manager

During the SC3/SC3.1/SC5 releases, the Method Exponent worked very closely with the Release Manager. This was largely due to the Release Manager having played a key role in the decision to adopt an "Agile" approach, but having had no experience in its use on a delivery project. As a consequence, the Release Manager sought assistance from the Method Exponent despite the fact that the Method Exponent himself had had no experience in the execution of an "Agile" approach. However, he did have expertise and experience in drawing on the Sysco methodology knowledge base, which included material on tailoring and executing "Agile" approaches.

A series of four interviews was conducted with the Release Manager, focusing on the adoption and execution of the SCRUM based "Agile" approach on the project. These interviews employed a semi-structured interviewing technique, and, within 24 hours of each interview, notes of the interview were documented for later analysis.

These notes provided additional insight into some of the motivations behind decisions relating to tailoring events observed during the course of the project.

6.3.5 Document Collection

During the preparation, execution and follow up from each MAW, a variety of documents of different types were produced. These included:

- MAW workbooks in which the structure of the tailored ISDM (including the defined lifecycle phases, the input and output work products and deliverables to be produced in each phase, and the dependencies between them) was documented;
- Tailored Method overview and dependency diagrams, either in a Visio or PowerPoint format;
- Word documents in which the structure and content of method documents such as work products was described in greater detail than that provided in the workbooks and diagrams referred to above.

In addition to the collection of documents associated with the MAWs, documents from the "Agile" methodology training sessions were also collected. These consisted of a number of PowerPoint based presentations. These were collected for subsequent analysis, which is described in section 6.4.

6.4 Analyse Data

6.4.1 Methods of Data Analysis

6.4.1.1 Observation of Agile Methodology Training

Observation of the SCRUM based Agile methodology training sessions took place principally to develop an understanding of the principles, terminology and key concepts of the ISDM in order to provide context to subsequent data collection and analysis activities.

6.4.1.2 MAW Observation and Interviews

A process similar to that described in Sections 5.4.1.1 was adopted for the analysis of data collected related to observation of MAWs and transcripts of audio recordings of interviews with MAW participants.

Observations documented in the notes against the key characteristics contained within CF_1 were mapped against the key characteristics identified in CF_1 developed in Section 4.3.1 and against the partially validated Conceptual Framework (CF_2) provided in Section 5.6.2. This included searching for further evidence to support the existence of the three discrete states in which an ISDM may exist (the "Methodology-as-Documented", "Methodology-as-Anticipated", and "Methodology-in-Action"), but also searching for potentially disconfirming evidence, which may indicate the presence of different or additional states. Evidence was also sought within the documented observations to support or refute the different ways in which transitions between and within these states can occur.

CF_1 proposed a large number of transitions between the states of an ISDM, whilst CF_2 identified those which had been observed in the first cycle of research.

An objective of the mapping was to identify which of the specific transitions between states identified in CF_1 were actually observed in this cycle of research.

Events which were recorded but which could not be mapped to one of these constructs were noted for further analysis in the "Reflect" phase of this cycle of research for possible inclusion in a further partially validated instance of the Conceptual Framework.

6.4.1.3 Document analysis

In the course of preparing for, executing, and following up on ISDM tailoring, a large volume of documents were produced, principally by the Method Exponent. Those documents which were relevant to the development of an understanding of ISDM tailoring were identical to those highlighted in Section 5.3.3 and consisted primarily of Excel spreadsheets, PowerPoint presentations, Visio diagram, and email messages.

Within the relevant subset of collected material, there was still a very large volume of documents totalling in excess of 160 megabytes of data. In order to make the analysis of these materials feasible, the materials were reviewed to identify those with particular significance in terms of forming an understanding of ISDM tailoring. This resulted in a smaller set of materials of a volume amenable to detailed analysis. Each member of this smaller set of documents was summarised in a "Document Summary Form" (see Appendix J) in which key features of the document were recorded.

The subset of documents was analysed to identify the nature of the changes being made to the ISDM from one instantiation to the next. The specific changes identified in this research cycle will are described in Section 6.4.2 and in Section 6.5. In summary they included modifications to either the structure of the ISDM, or to the content of the ISDM.

Documents such as Visio diagrams and PowerPoint presentations which showed the structure and content of the tailored ISDM were analysed from one version to the next. Changes between consecutive versions were recorded in a set of documents (see Appendix J and Appendix K) which amongst other things captured the version of the document under examination and the differences from the preceding version.

Emailed exchanges between key participants in ISDM tailoring were examined and, where appropriate, changes identified in the documents were linked to these emails or to statements from observations of the MAWs and participant interviews, in an attempt to identify the motivations for the changes being made to the ISDM.

6.4.2 Analysis Outcomes - Case Study Chronology

An outline of the case project and organisation which forms the basis for this cycle of research was presented in Section 6.2.1, as was a summary of the complex set of events which led to the creation of the SC5 release from its precursors (the SC3 and SC3.1 releases). This complexity and the lack of clarity, certainty and organisational churn which were features of the case project were also introduced in that section.

A chronology of the case is now presented, including a description of the key incidents which impacted on the project and which drove the various instances of ISDM tailoring.

6.4.2.1 Background to Development of the Initial Development of the Methodology-as-Documented

The original vision for the Supply Chain Program (SCP) included only three releases: SC1, SC2 and SC3. According to this release structure, the SC5 release did not exist. In mid-2008, in response to pressure from a key OzTel stakeholder (BSH-1), management of the program committed OzTel to the delivery of another release, SC4, which was not explicitly included within the contract.

In November/December 2008, a decision was made by Sysco management to merge the SC2 and SC3 releases into a single “mega-release” with 2 drops, referred to as SC3.1 and SC3.2 respectively in an effort to rein in costs which continued to increase significantly, in excess of budget, due (in part) to the decision to include the SC4 release within the program. This meant that the release approach now consisted of:

- SC1 – laid down the infrastructure platform for the entire program, and provided limited functional capability;
- SC4 – not included in the scope of the original contract, this release introduced the ability to manage the external contractor workforce; and
- SC3, consisting of two "drops", SC3.1 and SC3.2 – this release increased the amount of integration between the Sysco and OzTel significantly, allowing for completely electronic lodgement and management of requests for repair work.

This represented a significant departure from the original release plan, as specified in the contract, and placed considerable strain on the commercial relationship between Sysco and OzTel.

Despite the restructuring of releases in November/December 2008, costs on the program continued to rise, with estimates of the cost to complete the development of the SC3.1 release using a waterfall based approach consistently in the order of $54 million. Repeated attempts to reduce this amount significantly were unsuccessful. At this time, evidence was provided to the executive management team in the form of a spreadsheet based estimation model, which predicted that the adoption of an "Agile" approach to development would result in a reduction of costs in the order of $6 million. Consequently, a Scrum based "Agile" approach was adopted and used as the development methodology for the SC3.1 release.

The adoption of the Scrum based “Agile” approach represented a major change in the way in which the IT Systems team operated and resulted in further change to the emerging methodology. For example, with its frequent, short iterations, it was no longer feasible to conduct a series of reviews at the conclusion of each of the lifecycle phases. Instead, several of these were consolidated into a single review to be conducted per iteration. Figure 19 shows the difference in structure of the QAM review process when applied in a waterfall project versus that applied to a project adopting an "Agile" approach.

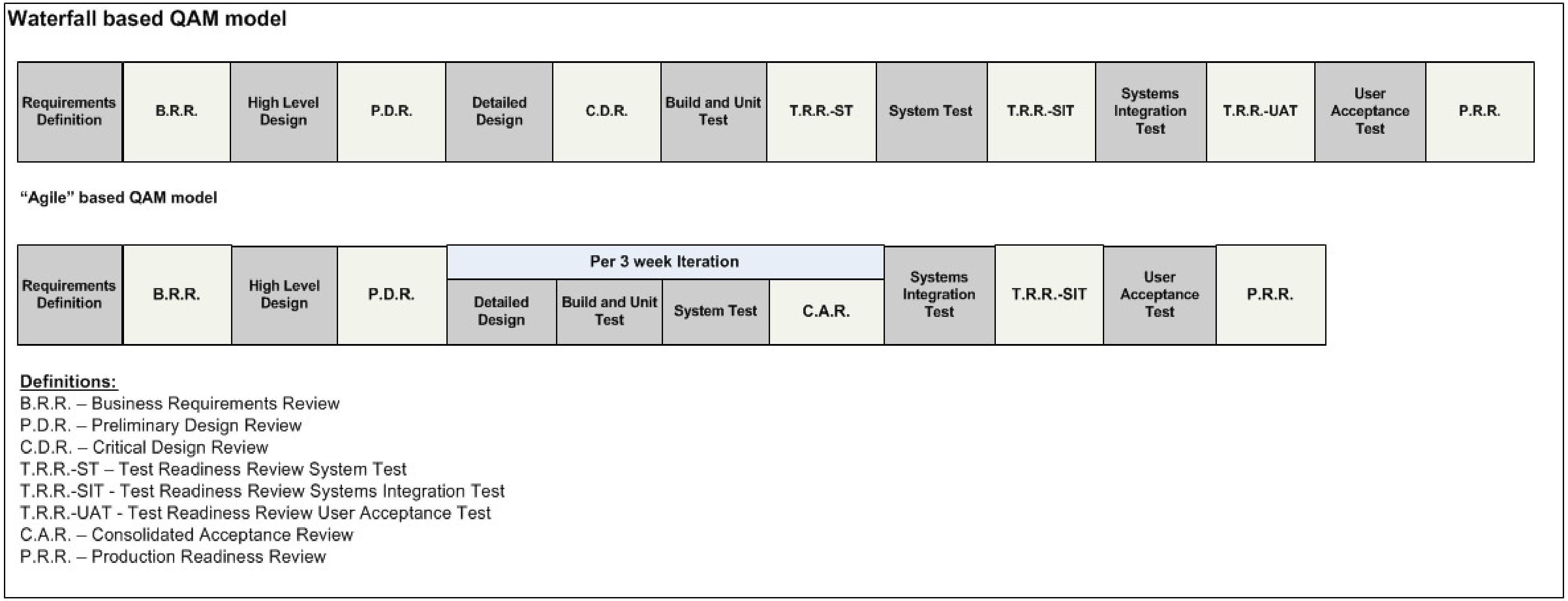

Figure 19 - Comparison of QAM review process in waterfall and agile projects

The initial attempts at adoption of the Scrum based "Agile" approach commenced in November 2008 and continued into March and April 2009. However, a number of problems began to emerge with the approach, attributed to the following circumstances:

- Few members of the SC3.1 team had any practical experience with the use of an "Agile" methodology;
- The project was large and complex with a large number of custom interfaces (in excess of 150) being developed;
- The development team was geographically dispersed among a number of countries and time zones; and
- Absolute commitment to the "Agile" approach by OzTel was not forthcoming.

By April 2009, with little or no progress having been made in defining user stories for the SC3.2 release and any cost savings expected to be delivered by the adoption of the "Agile" approach rapidly disappearing, the decision was made to abandon the "Agile" methodology and to revert to a more traditional, waterfall methodology, based on that produced for SC1.

As costs continued to rise throughout the first half of 2009 (largely because the SC4 release encountered significant problems whilst undergoing Systems Integration Test (SIT), resulting in a significant amount of additional testing and defect remediation being required beyond that which had originally been planned and budgeted for), management continued to search for ways to contain costs.

Addressing this issue resulted in changes to the releases to be delivered which were described in Section 6.2.1.1.

6.4.2.2 Development of the Methodology-as-Documented

At the time the SC5 release came into being in mid-2009, the SC1 release had been deployed into production for a number of months. However, one issue which had emerged in this earlier release was a perceived lack of governance and an inability for critical dependencies, which the IT Systems Team had for the IT development work, to be met.

Consequently, development of the Methodology-as-Documented for SC5 was driven by the need for improved governance in order to control scope, and to ensure that dependencies which the IT Systems Team had for their IT development work were met. The Methodology-as-Documented for SC5 was based on the Methodology-in-Action being executed at that time in the SC1 release. Key changes were to include the activities, dependencies and work products of the Business Operations and Business Process teams with those of the IT Systems team, within the Methodology-as-Documented. This instance of the Methodology-as-Documented was used to identify the critical interdependencies which the teams had on each other.

6.4.2.3 Development of the Initial Methodology-as-Anticipated

Cognisant of the scope creep problems which plagued the SC4 release and which ultimately led to the significant cost and schedule overruns and the abandonment of the release, Sysco management were keen to introduce additional measures into the ISDM through tailoring of the Methodology-as-Documented in order to reduce the likelihood of scope creep.

These additional measures included:

1. Adding a Requirements Definition Document (RDD) to the list of work products to be produced in the Project Preparation and Definition phase. The RDD was the first work product to attempt to identify which of the business requirements are being IT-enabled versus those being enabled through a manual process.
2. Mandating that a System Requirements Specification (SRS) work product be produced in the High Level Design phase. The SRS allocated requirements to each of the I.T system components involved in the solution.
3. Introducing a new Sysco/OzTel Toll Gate at the conclusion of the "Project Preparation and Definition" phase in order to lock down requirements scope.
4. Splitting the existing "Design" Toll Gate into a "High Level Design" Toll Gate and "Detailed Design" Toll Gate, with the first of these requiring OzTel participation and approval.

These changes to the Methodology-as-Documented for SC5 were responses to the concern expressed to the Method Exponent by Sysco management of the need to introduce measures to control scope creep, and resulted in the initial Methodology-as-Anticipated for the release.

6.4.3 Analysis Outcomes - Key Tailoring Events

Within the project narrative provided in Section 6.4.2, six key tailoring events were identified. These tailoring events are listed and described in some detail in Table 14 below.

Table 14 - Summary of Observed Tailoring Events in Research Cycle 2

Tailoring Event Number	Nature of Tailoring Event
1	This tailoring event related to an increase in the scope of the Methodology-as-Documented driven by the need for improved governance, control of scope, and to ensure that dependencies which the IT Systems Team had for their IT development work were met. Key changes were to include the activities, dependencies and work products of the Business Operations and Business Process teams with those of the IT Systems team within the Methodology-as-Documented. As these changes occurred prior to the inception of design and development work, the result was the creation of a new instance of the Methodology-as-Documented.
2	This tailoring event resulted in change to the Methodology-as-Anticipated in use on SC3.1 in order to adopt an "Agile" approach in place of the previous, waterfall based methodology. As work had already commenced on tailoring of the original Methodology-as-Documented, this tailoring event took place on the Methodology-as-Anticipated. The scope of this change was so significant that it resulted in a reversion to an earlier methodology state, the Methodology-as-Documented. The change was driven by a perception held by some of the project's managers that such an approach would result in time and cost savings. The adoption of an "Agile" approach included the consequential adoption of "User Stories" to document business level requirements.
3	This tailoring event contained the modification of the QAM process within the Methodology-as-Anticipated to accommodate the change from a waterfall based methodology to one operating using an "Agile" approach (Figure 19). The change was made to the Methodology-as-

	Anticipated just as development work was commencing with the new QAM process being executed immediately. This therefore resulted in the development of a new Methodology-in-Action.
4	This tailoring event detailed the addition of several work products and quality assurance points to the Methodology-as-Documented, based on requests by management to ensure that scope was rigorously controlled. This resulted in: the addition of the Requirements Definition Document and System Requirements Specification documents; the addition of a new Sysco/OzTel Project Preparation and Definition Toll Gate; and the splitting of an existing "Design" Toll Gate into separate "High Level Design" and "Detailed Design" Toll Gates, with the first of these requiring OzTel participation and approval.
5	Central to this tailoring event was the modification to the structure of the "Agile" approach to address deficiencies identified with it during execution. The timeboxing of all activities into 3 week iterations was believed to be constraining the ability to capture all requirements and to settle on the High Level Design. In part, this belief emerged from a difficulty in securing access in each iteration to the OzTel business experts from whom the requirements would be elicited. OzTel advised Sysco that this impacted the operations of their business and that they would rather have requirements definition undertaken in a single "big bang" iteration. In any case, the contract between OzTel and Sysco under which the program was operating mandated the preparation and sign off of a **single** requirements specification and a **single** High Level Design document and had not been modified to reflect the "Agile" approach. As a consequence of these influences, modifications were made to the Methodology-in-Action so that requirements definition and High Level Design were completed in one long iteration "up front", with Detailed Design, Build, and Test to be undertaken subsequently in 3 week iterations.
6	This tailoring event related to the creation of a new Methodology-as-

	Documented as a consequence of the abandonment of the "Agile" approach for SC3.1. A lack of relevant experience in the application of “Agile” methodologies coupled with a lack of commitment from OzTel to make their business SMEs available, resulted in the application of the “Agile” approach being unsuccessful. The program then adopted a waterfall based methodology based extensively on the Methodology-in-Action in place at the conclusion of SC1.

6.4.4 Analysis Outcomes - Initial Classifications

Section 4.3.1 introduced CF_1, which hypothesised that an ISDM may exist in three possible states during the life of a project (Methodology-as-Documented, the Methodology-as-Anticipated, and the Methodology-in-Action), and may transition between states in one of two ways, those being as a **contingent** tailoring event, or as an **improvised** tailoring event.

Each state transition can be described by documenting the initial and final states of the ISDM, and the type of transition observed between those states. Each of the key tailoring events identified in Table 14 is described in more detail in these terms in Table 15 below.

Table 15 - Classification of States and Transition Type in Research Cycle 2

Tailoring Event Number	Methodology States		Form of Tailoring	Classification of Tailoring Event
	Initial State	Final State		
1	Methodology-as-Documented	Methodology-as-Documented	Contingent	This tailoring event related to an increase in the scope of the Methodology-as-Documented to provide for improved governance and control of delivery scope, and also to ensure that dependencies which the IT Systems Team had for their IT development work, were met. These changes occurred prior to the inception of design and development work, resulting in the creation of a new instance of the Methodology-as-Documented. This tailoring event was a pro-active response to perceived limitations in the methodology deployed in the SC1 release and as such was an example of **contingent** tailoring.
2	Methodology-as-Anticipated	Methodology-as-Documented	Contingent	This tailoring event resulted in the adoption of an "Agile" approach in place of the previous, waterfall based Methodology. The change was a response to a perception articulated by some of the project's managers that adoption of an "Agile" based methodology would result in time and

				cost savings. This tailoring event was a pro-active response to a change in one of the project's contingency variables (i.e. cost) and as such was a further example of **contingent** tailoring.
3	Methodology-as-Anticipated	Methodology-in-Action	Improvised	This tailoring event records modification of the QAM process within the Methodology-as-Anticipated in order to accommodate the change from a waterfall based methodology to an "Agile" one. The change was made to the Methodology-as-Anticipated **after** the initial adoption of the "Agile" approach, in a separate instance of tailoring just as development work was commencing, with the new QAM process being executed immediately. This was a reactive response to emergent changes in the project and drew heavily upon the Method Exponent's knowledge and experience of methodology tailoring and technical governance, and consequently the development of a new Methodology-in-Action was an example of **improvised** tailoring.
4	Methodology-as-	Methodology-	Contingent	This tailoring event details the changes made to the

	Documented	in-Action		Methodology-as-Documented in response to management requests to ensure that scope creep was controlled. After careful consideration of the requests, several work products and quality assurance points were added to the methodology. As these changes once again represented a pro-active response to a change in project circumstances, they represent a **contingent** tailoring event.
5	Methodology-in-Action	Methodology-in-Action	Improvised	This tailoring event involves the modification of the structure of the "Agile" approach to address perceived deficiencies identified during execution. Rather than undertaking requirements definition and High Level Design in one or more three week long iterations, these modifications resulted in these activities being completed in one 7 week iteration "up front". This tailoring event was in response to perceived issues which arose during execution of the Methodology-in-Action. The response drew on the knowledge and experience of ME-6 to produce what was considered an appropriate response to changing project circumstances. As such, it represents an **improvised** tailoring event.

6	Methodology-in-Action	Methodology-as-Documented	Contingent	This tailoring event relates to the creation of a new Methodology-as-Documented as a consequence of the abandoning of the "Agile" approach for SC3.1 and the adoption of a waterfall based methodology based on a tailored version of the Methodology-in-Action in place at the conclusion of SC1. This represented a very significant change in the approach to the definition and application of methodology on the program and in effect resulted in the definition of a new Methodology-as-Documented. Whilst the impetus for these changes was emergent, the response was developed over a period of two to three weeks, with the methodology itself not being executed until after this. This therefore represents a pro-active response to a change in project circumstances, and a further example of a **contingent** tailoring event.

6.5 Reflect

In this cycle of research, reflection centred on validating CF_2 which was presented in Section 5.6.2. This validation took the form of drawing evidence from the case to support the key constructs proposed in CF_1, and partially validated in CF_2, being:

- An ISDM exists in three states: Methodology-as-Documented, Methodology-as-Anticipated and Methodology-in-Action
- Transitions between states can occur in one of two fundamentally different ways:
  - Contingent tailoring
  - Improvised tailoring

In this cycle of research, evidence was obtained to support the existence of five of the 18 transitions proposed in CF_1 (Section 6.4.4)

6.5.1 Reflection on Utility of Alternative Models

This section provides a brief assessment of whether the ISDM tailoring events observed in the course of this cycle of research could have been interpreted using the alternative models proposed in Section 2.5, or whether there were events observed which did not fit the revised Conceptual Framework presented in Section 5.6.2.

Each of the six tailoring events observed in this cycle of research could have been interpreted using Appropriation as the analytical lens. However, in a similar way to the events identified in Section 5.5.1, analysis which employed Appropriation as the lens would have been at such a high level as to provide no meaningful information as to the process of tailoring.

Similarly, Opportunism was previously identified in Section 2.5 as alternative construct with which to view ISDM tailoring. Of the six tailoring events identified in this case, two of them (events 3 and 5 in Table 14) could, by their nature, have been analysed using opportunism as the lens. However, had this been done, it would have provided only a partial fit with the observed events, as key to each of them was the leveraging of the practitioners' knowledge and experience. Such a feature is not a characteristic of opportunism, and as such, would have been lost.

The events described in Section 6.4.4, however, could not be interpreted using Situated Action as the analytic lens. The principal reason for this is that change viewed using the lens of Situated Action potentially incorporates separation in time between the development and execution of a response to a change, whereas in an improvised response, the development and execution of a response are simultaneous, or very tightly connected in a temporal sense. In the current cycle of research, a key feature of those events ultimately categorised as "Improvised" was the tight coupling between the stimulus for change, and the change itself.

As was the case in the first cycle of research, all six key tailoring events described in Section 6.4.4 were able to be categorised using the constructs contained within CF_1. No tailoring events were observed in this case which did not fit the emerging model of ISDM tailoring.

In summary, in addition to seeking evidence to support the model proposed in CF_1 and partially validated in CF_2, the researcher was sensitive to data which might invalidate elements of the emerging model. However, data collected in this case failed to provide any evidence to support the identification of additional states or types of transitions beyond those proposed in CF_1 and subsequently partially validated in CF_2. The further validated Conceptual Framework (CF_3) is presented in Section 6.5.4.

6.5.2 Summary of the Application of Structured-Case

Section 3.4.2.1 introduced the structured-case framework and described how it includes a planning phase, a data collection phase, and data analysis phase, and a reflection stage (Carroll and Swatman 2000). Appendix L summarises the major activities undertaken within each of the structured-case phases.

6.6 Discussion

6.5.3 Implications for Theory

The case described in this chapter provides additional evidence to support elements of CF_1 and extends the partially validated form of CF_1 presented in Section 5.6.2.

6.6.1.1 Identification of States of ISDM

Observations from this cycle of research have provided additional evidence to support the "Methodology-as-Anticipated" construct. As was the case with the SC1 project described in Chapter 5 we observed that the ISDM deployed on the SC3/SC3.1/SC5 case project went through multiple instances of tailoring prior to its deployment and execution. These instantiations of the M-a-A were discrete steps in the methodology tailoring and deployment process. The type and extent of differences between each of the instantiations varied.

6.6.1.2 Identification of Transitions Between States of ISDM

Studies of ISDM tailoring to this point had not described instances of the transition between the initial (Methodology-as-Documented) state of an ISDM and its final, in-use state (Methodology-in-Action).

Within research cycle two, evidence to support a number of additional transitions proposed in CF_1 was obtained. This was used to provide further validation of the Conceptual Framework (Section 6.5.4).

6.5.4 Validating the Conceptual Framework

In this cycle of research, five of the 18 transitions proposed in the Initial Conceptual Framework unseen in the first cycle of research, were observed. These were:

- Recursive contingent tailoring transition of the Methodology-as-Documented state;
- Contingent tailoring transition between the Methodology-as-Anticipated and the Methodology-as-Documented states;
- Contingent tailoring transition between the Methodology-as-Documented and the Methodology-in-Action states;
- Contingent tailoring transition between the Methodology-in-Action and the Methodology-as-Documented states; and
- Recursive improvised tailoring transition of the Methodology-in-Action state.

Insights identified from within this cycle of research are captured in a model of ISDM tailoring on large, complex, commercial Information Systems Projects. The Conceptual Framework (CF_3) is shown in Figure 20.

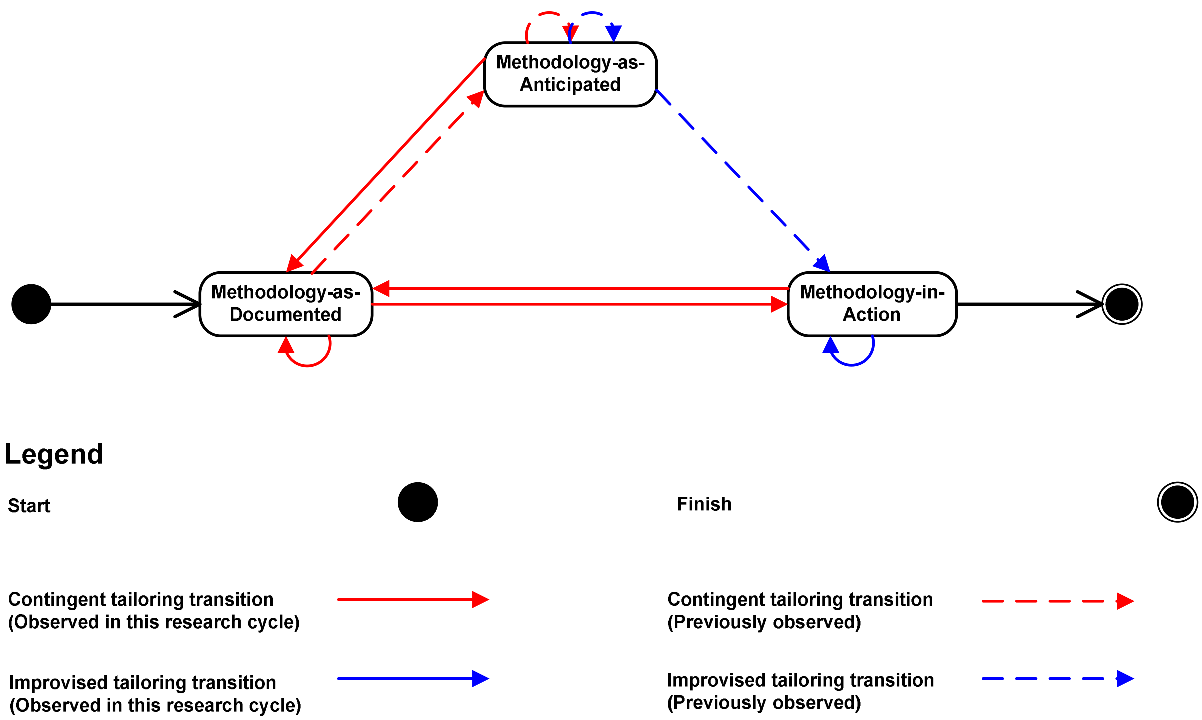

Figure 20 – Partially Validated Conceptual Framework (CF_3)

Within Figure 20, the lines drawn between states of the ISDM have the following meanings:

- A dashed red line indicates a transition observed between two states of the methodology executed in a **contingent** way, seen in the previous case project**;**
- A dashed blue line indicates a transition observed between two states of the methodology executed in an **improvised** way, seen in the previous case project;
- A solid red line indicates a transition between two states of the methodology **proposed** to be conducted in a **contingent** way, which was observed in the current case project; and
- A solid blue line indicates a transition between two states of the methodology **proposed** to be conducted in an **improvised** way, which was observed in the current case project.

6.7 Chapter Summary

This research cycle has investigated the tailoring of an ISDM on a second large, complex, commercial Information Systems project. Following initial planning (Section 6.2), a variety of methods for the collection and analysis of data were employed (Section 6.3), and a variety of types of data were collected (Section 6.4), which strengthens the theory being built by providing for triangulation of evidence (Eisenhardt 1989; Neuman 2003). As was the case in Chapter 5, the types of data collected included method documents, notes of observations of MAWs, and interviews with ISDM tailoring participants and the release manager.

The Conceptual Framework (CF_3) presented in Section 6.5.4, addresses the second research question, "*To what extent does the synthesised model of ISDM tailoring reflect contemporary practice of ISDM tailoring as conducted in large, commercial projects?*". It accomplished this by focusing on analysing, for the first time, examples of the following types of tailoring events:

- Contingent tailoring transitions between one instantiation of the Methodology-as-Documented and another;
- Contingent tailoring transitions between the Methodology-as-Anticipated and the Methodology-as-Documented;
- Contingent tailoring transitions between the Methodology-as-Documented and Methodology-in-Action;

- Improvised tailoring transitions between one instantiation of the Methodology-in-Action and another; and
- Contingent tailoring transitions between the Methodology-in-Action and the Methodology-as-Documented.

A key vehicle for achieving this was observation of MAWs, which provided an opportunity for the researcher to observe interactions between the individuals, which provided insights into factors which influence ISDM tailoring. The interviews conducted subsequent to the MAWs with selected participants then provided opportunities for in-depth investigation of themes which emerged during the MAWs. Interviews with the Release Project Manager enabled the development of additional insight into some of the motivations behind decisions relating to tailoring events observed in the course of the project, whilst analysis of the collected documents allowed identification of the nature of the various instances of tailoring and allowed the researcher to connect them to motivations for those tailorings, as documented in email exchanges between participants or in the interviews.

The Conceptual Framework initially proposed in Section 4.3.1 and validated in Section 5.6.2 has been further validated to reflect observations from this research cycle (Sections 6.5 and 6.6) and presented in Section 6.5.4 as CF_3.

7 RESEARCH CYCLE 3 – OZTEL TELETRANSFORM PROGRAM

7.1 Introduction

In this chapter, ISDM tailoring on a third project within the case organisation described in Chapters 5 and 6 is examined, and the Conceptual Framework introduced in Chapter 4 and validated in Chapters 5 and 6 is further validated.

This third cycle of research focuses on:

- Providing further empirical validation of the notion and utility of the states in which a methodology may exist presented in Chapter 4 and tested in Chapters 5 and 6, with a particular emphasis on searching for examples of previously unobserved transitions; and
- Analysing, for the first time, examples of contingent tailoring transitions between the Methodology-in-Action and the Methodology-as-Anticipated.

In terms of the overarching question and research questions introduced in Chapter 1, this chapter addresses the following question: "*To what extent does the synthesised model of ISDM tailoring reflect contemporary practice of ISDM tailoring as conducted in large, commercial projects?*".

This chapter is structured as follows. The case project examined in this cycle of research is described and the planning of this research cycle is reported (Section 7.2). The methods used for the capture of data in this cycle of research (Section 7.3) and the methods used to analyse the collected data (Section 7.4) are presented. The collected data and observations against the Initial Conceptual Framework presented in Section 4.3.1 and against the literature are reported (Section 7.5). Finally, validation of the Conceptual Framework, required as part of applying Structured-Case, is presented (Section 7.6).

7.2 Plan

7.2.1 The Selected Case

7.2.1.1 Case Project Origins

Section 3.6.2.1 introduced Sysco as the case organisation studied in this research and described the increased competition which its client OzTel was subject to and the need to reduce the costs of operating its business.

A significant part of the problem for OzTel as a legacy business was that the IT systems which it used to manage the business and operational sides of its activity were generally old, heavily fragmented, and often ran on large mainframe computers which required increasing maintenance of both the hardware and software. Furthermore, the fragmented nature of the applications (of which there were more than a thousand) meant that Customer Service Operators ("CSOs") often had to use a variety of applications when dealing with a single customer. This complex application landscape replicated, to a large degree, the organisational structure of OzTel, which consisted of a number of vertical business “silos”.

With the appointment of a new CEO on July 01 2005, OzTel embarked on a period of rapid transformation. The emphasis of the transformation was on providing a “one customer, one click” ability for CSOs when dealing with customers through a call centre, and for the customers themselves when managing their accounts online.

The entire transformation program, referred to in this chapter as the "TeleTransform" program, was organised into a number of releases, with each release typically focusing on a particular market segment.

Within each release, the overall body of work was divided into two main areas. One focused on the transformation of the Business Support Systems (BSSs), which included the implementation of an enterprise wide Customer Relationship Management (CRM) package. The lead provider for this piece of work was another large, global IT and services company, identified here as Axxess.

The other main area of work under the TeleTransform program was the updating of the Operational Support Systems (OSSs). It is this which forms the basis of this case. The OSS program covered replacement of existing legacy systems in the following functional "domains":

- Customer Service Assurance;
- Fulfilment; and
- Inventory.

These domains were to be “glued” together using a flexible integration package built around a Service Oriented Architecture (SOA) approach. This was organised as a separate domain, referred to as the “Mediation” domain.

OzTel chose Sysco as the lead provider of the OSS program. It was also chosen as the Systems Integrator and thus had responsibility for developing the integration components, and ensuring that the packages being supplied by the independent software vendors (ISVs) were able to communicate effectively with each other and with the BSS systems.

Whilst they were viewed as separate programs of work, there were interdependencies between the BSS and OSS programs – which were being managed by different organisations - in fact organisations which were natural competitors in the marketplace. Aggressive timelines for implementation were put in place by OzTel.

7.2.1.2 Case Project Objectives

A key objective of the TeleTransform program was to reduce the number of applications within OzTel, with considerable emphasis placed by OzTel on the use of packages. A further objective was, wherever possible, to use packages which operated on mid-range platforms with lower capital and operational costs compared to mainframe computers. As part of this process, OzTel identified the packages which were to be deployed in each of the domains; the companies engaged to undertake the work had no say in the selection of these packages.

The scope of the program was vast, impacting on virtually every aspect of the business operations of OzTel. To provide some indication of size, the overall budget for the five year program of work was $11 billion. Sysco alone received revenues in the order of hundreds of millions of Australian dollars from OzTel in the first twelve months of the program.

OzTel recognised that the project was large and complex, requiring the integration of a variety of packages from multiple vendors, many of which would communicate in real time.

Sysco put in place a large, complex team structure to support the development. This team structure reflected the way in which OzTel wanted the program delivered.

Essentially, the program was to be delivered in a number of releases. Each release would deliver functional capability from one or more domains (e.g. Customer Service Assurance, Fulfilment, Inventory, and Mediation). Within each domain, the solution was to be implemented by one or more project teams (see Figure 21 below).

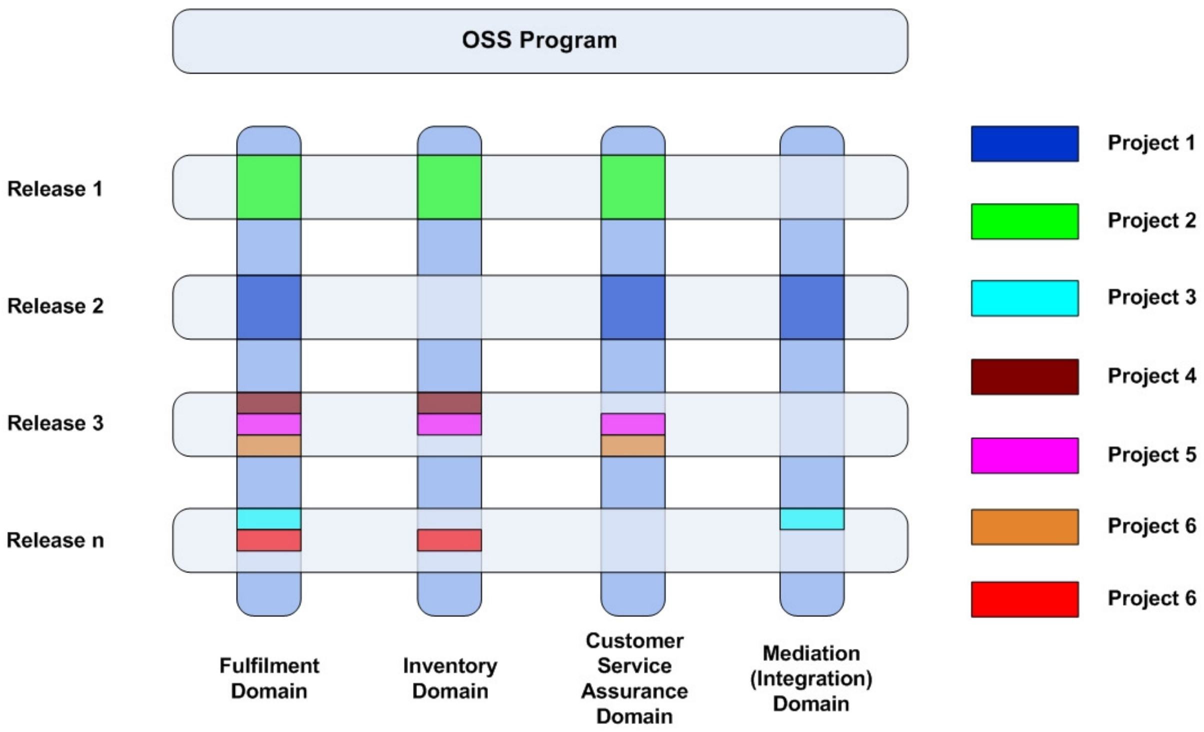

Figure 21 - Structure of OzTel OSS Transformation Program : Research Cycle 3

Within each release, a team of IT Architects (ITAs), Business Analysts (BAs) and Project Managers (PMs) was appointed. For example, each release group had a lead architect, supported by a number of other architects. Similarly, each of the release streams within a release group had a lead architect supported by other architects. A similar structure was in place for the BAs and PMs.

Sysco soon discovered that the assumptions on which selection of some of the packages had been made were flawed. For instance, the package selected by OzTel to provide much of the functionality of Customer Service Assurance had never been implemented and was still under development. Also, the key objective of implementing the packages with little or no customisation was also unattainable, as many of the packages required extensive customisation to suit the particular needs of OzTel.

It is important to note that the focus of this case was on the tailoring of the ISDM which occurred during the project itself, rather than on the influence of organisational features such as the program and project structures described above.

One of the first tasks that had to be undertaken was to tailor the Sysco methodology to suit the particular technical and contractual constraints of the OSS program. It is this tailoring process which is the focus of this research cycle and which is discussed later in this chapter.

7.2.1.3 Case Project Stakeholders

Sysco saw the definition and application of a suitably tailored ISDM as a key element of its approach to the delivery of the program's outcomes, but also saw it as a way in which to control the risks associated with the delivery of such a large, complex program. This led to the identification of three principal stakeholder organisations, including four discrete groups of stakeholders:

1. Sysco Stakeholders

   a. Sysco IT Stakeholders

   The various teams which Sysco staffed were responsible for the specification, design, development, test and delivery into production of the IT system, including co-ordination of the activities of the third party vendors. A key activity early in this development process was the definition of the methodology to be adopted.

   b. Sysco Program Executives

   Whilst the contract between Sysco and OzTel specified the commercial obligations required of Sysco, day to day operational accountability for delivery rested with a small number of senior Sysco executives. These executives were stakeholders with an interest in the outcome of ISDM tailoring activities, as they required that all of the commercial obligations which Sysco had to OzTel were identified, and that the tailored ISDM provided a path to their delivery. However, given their lack of direct involvement in ISDM tailoring, none of this group of stakeholders was interviewed.

2. Third Party Vendor Stakeholders

   Third Party vendors (referred to here as Independent Software Vendors, or ISVs) were the subject of separate commercial arrangements between themselves and Sysco. These ISVs had an interest in the tailoring of the Sysco ISDM, as it provided them with a clear view of what they had to deliver to Sysco and when.

   The tailored ISDM provided templates for the ISVs, which they were expected to use when providing inputs to Sysco. This ensured that inputs from multiple ISVs were consistent in content and presentation.

   It should be noted that the tailored Sysco ISDM only defined the **interface** between Sysco and the ISVs. That is, it specified what Sysco was to provide to the ISVs in order for them to undertake their work, and also specified what the ISVs were to deliver to Sysco. It did not specify how the ISVs were to develop them, as it was assumed that each ISV had its own ISDM which would be used for the development of their deliverables.

As the ISVs were not involved in the tailoring of the Sysco ISDM, none of them were interviewed as part of this study.

3. OzTel Stakeholders

   OzTel was principally interested in ensuring that the outcomes specified by the commercial agreements in place between OzTel and Sysco were met. OzTel saw the tailored ISDM as the means by which these outcomes would be delivered. Their focus was in ensuring that the tailored ISDM accurately identified all of the deliverables which they required, and that the tailored ISDM would deliver. How that tailored ISDM was arrived at was of little interest to them.

   As was the case with Sysco Program Executives and Third Party Vendors, their lack of direct involvement in ISDM tailoring meant that none of this group of stakeholders was interviewed.

7.2.1.4 Case Project Environment

There were essential differences in interest between OzTel and Sysco in the development and application of a suitably tailored ISDM for the program.

The TeleTransform project was highly visible throughout Australia, with much of OzTel's reputation and that of its CEO, resting on its successful implementation. OzTel's principal interest was therefore in ensuring that the various commercial outcomes were met by the specified date and in an acceptable format - how this was arrived at was of little interest to OzTel.

For Sysco however, substantial penalties applied if it failed to meet contracted dates for delivery, or failed to deliver to an acceptable level of quality. Ensuring that all of these obligations were identified, and a structured approach to their development (including identification of relevant inputs and dependencies) put in place, was a key motivation for the selection and tailoring of a suitable ISDM.

7.2.2 Planned Data Collection

The objective of this cycle of research is, as in the preceding two cycles of research, to find confirming and dis-confirming evidence for the concepts proposed in the Initial Conceptual

Framework introduced in Section 4.3.1 as CF_1 and subsequently partially validated in Sections 5.6.2 and 6.5.4 as CF_2 and CF_3 respectively.

In the light of the description of the selected case (Sections 7.2.1.1 and 7.2.1.2), and the identified stakeholders (Section 7.2.1.3), data collection was planned to include the following activities:

- Observing the Method Adoption Workshops (MAWs) in which ISDM tailoring was to occur on the case project;
- Interviewing Method Exponents, and IT Architects to explore areas of interest which emerged during the observation of the MAWs, such as clarifying the rationale behind actions taken or documents produced during the MAWs; and
- Collecting documents generated in preparation for, during, and subsequent to MAWs so that changes made to the ISDM throughout the tailoring process can be identified and motivations for the changes deduced.

A total of four MAWs were selected, each involving two Method Exponents and one Architect. Observation of each of these MAWS was scheduled, including audio recording and field note taking employing the protocols discussed in Section 3.6.3.1.

Following the MAWs, interviews were scheduled with the two Melbourne based participants, employing the interview protocols discussed in Section 3.6.3.2**.**

Document collection in this research cycle focused on the collection and analysis of the documents which recorded the structure and content of the various tailored forms of the ISDM and which recorded communications between participants in ISDM tailoring.

Management of the data collected followed the protocols discussed in Section 3.6.5**.**

7.3 Data Collection

7.3.1 MAW Observation

MAWs conducted during this project were of two different types. Three MAWs were relatively informal sessions involving two or more Method Exponents. The purpose of these MAWs was to define the high level approach to the delivery of the TeleTransform program of work, including:

- Selection of the Methodology-as-Documented on which to base subsequent tailoring efforts; and

- Development of a Methodology-as-Anticipated by:
    - Defining the phases to be executed in each of the several releases;
    - Placing the deliverables required of Sysco by OzTel within each of the phases;
    - Identifying the input work products required to prepare each deliverable; and
    - Identifying any dependencies on other parties such as ISVs.

The second type of MAW dealt with tailoring of the Methodology-As-Anticipated, referred to above, to suit the specific needs of each of the domains for which Sysco was responsible. In this sense, the Methodology-as-Anticipated, which emerged from the initial, high level tailoring, served as the Methodology-as-Documented for the domain-specific instances of tailoring. This MAW was formal, conducted by Method Exponents and IT Architects, to tailor the ISDM for the Customer Service Assurance domain. Two of the Method Exponents were based in Melbourne, with a third based in Adelaide, some 800 kilometres away. Due to the geographical separation, much of the interaction between these two groups was undertaken in the form of email. One of the MAWs observed involved participants who were geographically separated. In this case, the protocol discussed in Section 3.6.3.3 for the collection and analysis of data collected from these email exchanges was followed.

Unlike the previous two cycles of research, in this cycle of research, the researcher was not a member of the development team. Consequently, the presence of the researcher had minimal influence on the tailoring process being examined.

7.3.2 Interviews with MAW Participants

The Method Exponents and lead IT Architect were interviewed immediately following the formal MAW to capture their reflections on the MAW and to allow for investigation into events observed during the MAW which required further investigation. These interviews used a semi-structured interviewing technique (see Section 3.5.1.1**)**. Follow-up interviews were also arranged with MAW participants, in order to seek clarification of issues which emerged subsequent to the MAW. The MAW participant interviews conducted are listed in Table 16. Additional follow-up interviews also took place with interviewees ME-1 and ME-4. Note that Appendix D provides biographical details of MAW participants. The interviews were recorded using a digital audio device. These interviews were then transcribed. As soon as possible after each interview (but always within 24 hours), a Contact Sheet was completed to provide a summary of the interview, and to highlight the key areas of interest which required follow up. The form used for this is provided in Appendix E.

Table 16 – Table of Sources of Data in Research Cycle 3

Interviewee **See biographical details in Appendix H**	**Data Collected**
ME-1 ME-4 ME-8	Responses to questions relating to observations of actions taken, documents produced, or comments made during ISDM tailoring sessions covering the Customer Service Assurance domain of the TeleTransform program, with a specific emphasis on the structure of the ISDM being decided upon, and on the identification of work products from an architectural perspective.
Attended/Participated in MAW but NOT interviewed	
RITA-4	Observations of actions taken, documents produced, or comments made during the formal ISDM tailoring session covering the Customer Service Assurance domain of the TeleTransform program.

7.3.3 Document Collection

The documents collected in this research cycle included:

- Excel based MAW workbooks in which the structure of the tailored ISDM (such as lifecycle phases, work products included in and excluded from each phase, along with a rationale for the inclusion/exclusion, and dependencies between the work products) were recorded;
- Visio diagrams and PowerPoint presentations representing the structure and content of the ISDM;
- Word documents; and
- Email exchanges between key participants in the tailoring process.

A total of more than 500 megabytes of electronic documents of the types described above were collected during this case for subsequent analysis, to be performed using the protocol discussed in Section 7.4.1.2.

7.4 Analyse Data

7.4.1 Methods of Data Analysis

7.4.1.1 Analysis of MAW Observation and Interviews

As the structure of each research cycle was similar, and similar types of data were being collected, the process used previously for the analysis of data collected during observation of MAWs and interview transcripts (Sections 5.4.1.1 and 6.4.1.1) was applied. Observations documented in the notes were mapped against the key characteristics contained within CF_1 and the subsequently validated CF_3. This included providing evidence to support the existence of the three discrete states in which an ISDM may exist (the "Methodology-as-Documented", "Methodology-as-Anticipated", and "Methodology-in-Action"), but also searching for potentially disconfirming evidence, including different or additional states. In addition, evidence to support or refute the different ways in which the transitions between and within these states (where tailoring events occurring in either a pro-active (or contingent) manner, or a reactive (or improvised) manner) can occur, was also sought.

Where a tailoring event was identified which could not be mapped to one of the methodology state or transition concepts previously observed, a note was made for further analysis in the "Reflect" phase of this cycle of research, for possible inclusion in another instance of a Conceptual Framework.

A significant volume of sample data from this case is presented in Appendix N.

7.4.1.2 Document Analysis

The process employed for analysis of documents collected in this case followed the process described in Section 3.6.4 in that:

- The large volume of documents (in excess of 500Mb of electronic documents) produced by the three Method Exponents were reviewed and prioritised to identify those of particular significance in terms of understanding ISDM tailoring. Each member of the prioritised set of documents had a "Document Summary Record" produced in which key features of the documents were recorded (see Appendix J);
- The reviewed and prioritised subset of documents was then analysed to identify the nature of the changes being made to the ISDM from one instantiation to the next. Consecutive versions of each type of documents in the subset were examined in order to identify the changes which occurred from version to version. These changes were recorded in a set of "Artefact Comparison Record" documents (see Appendix J);

- The collection of email messages was examined using the date and time stamp and message subject to find message threads which were associated with the versions of documents being examined so that potential motivations for tailoring events could be established; and
- Field notes made during observation of the MAWs, and interview transcripts from the Method Exponent interviews were also reviewed in order to identify potential motivations for the tailoring events.

The specific changes identified in this research cycle are described in detail in Section 7.5, however, in summary, they typically included modifications to either the structure of the ISDM, the content of the ISDM, or both.

7.4.2 Analysis Outcomes - Case Study Chronology

In this section, a chronology of the case is documented, as emerged during the analysis of data collected, including a description of the key incidents which represent instances of ISDM tailoring.

7.4.2.1 Development of the Methodology-as-Documented

As the process of finalising the contract between OzTel and Sysco neared its completion, a small group of highly experienced Method Exponents was assembled to estimate schedule and cost. A key element of this process was the selection of a Methodology-as-Documented from Sysco's library of development methodologies ("Delivery Processes" in Sysco terminology) on which to base the project and against which subsequent tailoring efforts could be applied.

Whilst one of OzTel's key objectives from the TeleTransform program was the use of packages, the need to integrate the packages with the very large number of legacy applications remaining in the OzTel application landscape meant that there was a very significant amount of development work required. As a consequence, Sysco's "Custom Application Development" delivery process was selected as the foundation for the development effort and thus represented the initial Methodology-as-Documented.

7.4.2.2 Development of the Initial Methodology-as-Anticipated

The first step in the development of an initial Methodology-as-Anticipated was the need to incorporate Sysco's Quality Assurance Method (QAM) into the emerging ISDM. This was as a result of an internal Sysco mandate that all complex Information Systems projects with a total value in excess of $5 million should incorporate the QAM into their delivery approach. As was the case with the projects reported in Chapters 5 and 6, this resulted in additional activities and documents (specifically, a set of Quality Assurance reviews at key points in the lifecycle and the identification of points in the lifecycle where a baseline of key documentation should be taken) being introduced to the methodology as the definition of the initial Methodology-as-Anticipated proceeded.

Following contract signing in mid-2006, work on defining the project to a higher level of detail and on assembling the project team began. The small team of business executives and IT architects, assembled in the pre-contract signing period to outline the solution, was replaced by a larger team of experienced Method Exponents, Project Managers and IT Architects.

During this period, ISDM tailoring activities focused on taking the set of deliverables which the contract specified that Sysco was to supply to OzTel and, working within the framework of the initial Methodology-as-Documented:

- Identify in which phases the deliverables were to be produced;
- Identify the inputs into those deliverables in the form of work products;
- Allocate responsibilities for the development of those work products (for example, to ISVs, or to specific functional teams within the Sysco project team); and
- Define the dependencies between the deliverables and work products.

The activities at this time were focused on **program** level ISDM definition, rather than considering the more fine grained work which each of the domains would need to undertake.

As an example of this, one of the deliverables to OzTel was a “Release Level Data Migration Plan”. This spelt out to OzTel the various applications which, for a particular release, required data to be migrated from a legacy system into a transformed one. Within each domain, however, a similar activity was required, the outcome of which was a more detailed “Domain Data Migration Plan”.

Reflecting the complexity of the program of work, further decomposition of the deliverable/work product relationship was required. As a domain could contain many software components, a “Domain Data Migration Plan” might require inputs in the form of “Component Data Migration Plans” from a number of components. Figure 22 shows this hierarchical relationship.

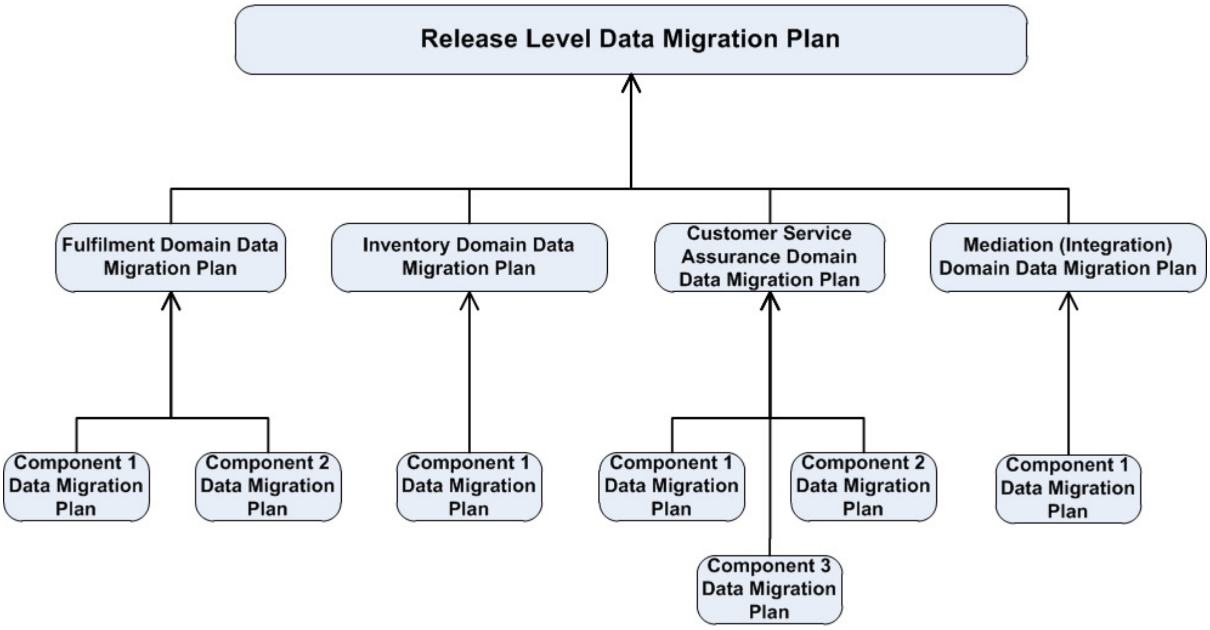

Figure 22 - Decomposition of Contractual Deliverables : Research Cycle 3

7.4.2.3 Development of Further Instances of Methodology-as-Anticipated

The initial program level Methodology-as-Anticipated was then subjected to further tailoring as planning for the delivery of the TeleTransform program continued. This additional tailoring occurred at both the program level, and at the domain level.

At the program level, the tailoring of the Methodology-as-Anticipated took a number of forms, including:

- Supplementing the initial Methodology-as-Anticipated with additional work products drawn from the base Methodology-as-Documented, or from other Delivery Processes based on the understanding of the way in which the deliverables were to be produced;
- Eliminating previously identified work products. As an example, a number of work products which were to have been created by OzTel and supplied to Sysco as inputs into the preparation of deliverables were removed. This included eliminating the need for OzTel to supply the "OzTel End State Architecture Document" as an input into the Sysco generated "Release Definition – Architecture" deliverable;
- Changing the scope and definition of previously identified work products as the responsibilities of Sysco, OzTel and the ISVs were refined; and
- Moving creation of deliverables and work products from one phase to another, as understanding of the dependencies to be met in order to produce the deliverables was

refined. For example, the release level "Test Plan" deliverable was moved from the High Level Design phase to the Detailed Design phase, as the inputs required to complete the release level deliverable would not be available until then.

As the project progressed and the program level tailoring led to a refined understanding of the overall approach to delivery, tailoring of the Methodology-as-Anticipated was required in order to refine the understanding of the work products to be produced and their interdependencies at the domain level.

7.4.2.4 Development of a Methodology-in-Action

The final key tailoring events which occurred were the instantiation and execution of a domain-specific Methodology-in-Action from a Methodology-as-Anticipated, and further subsequent tailorings of the Methodology-in-Action.

The previous sections have discussed the selection of a Methodology-as-Documented and its initial tailorings, as planning for the project was performed. However, as the project moved from the planning phase and into development, each of the functional domains needed to undertake their own ISDM tailoring. They needed to define, at a detailed level, how their inputs into the program level deliverables would be produced. The MAWs conducted during this time resulted in the development of a more fine grained and detailed Methodology-as-Anticipated at the Customer Service Assurance domain level.

As development commenced, this Methodology-as-Anticipated was executed, and in doing so, became an instance of the Methodology-in-Action. In parallel with its execution, this Methodology-in-Action was itself subjected to two further forms of tailoring:

1. At the **domain** level: The Methodology-in-Action applied in the Customer Service Assurance domain was subjected to further tailoring as work in the domain progressed, and additional change in the program level ISDM filtered down to the domains, and as lessons learned in the course of planning for and executing work in the Customer Service Assurance domain were fed back into the ISDM. These additional tailorings led to the creation of additional domain-specific instances of the Methodology-as-Anticipated, some of which were subsequently instantiated and executed as domain-specific Methodology-in-Action instances.

2. At the **program** level: The Methodology-in-Action executed within the Customer Service Assurance domain was subjected to tailoring, the focus of which was on feeding back improvements into the program level Methodology-as-Anticipated. This

in turn was used as the basis for subsequent domain level Methodology-as-Anticipated instances.

All of the instances of tailoring noted above are now analysed in detail, in Sections 7.4.3 and 7.4.4.

7.4.3 Analysis Outcomes - Key Tailoring Events

Within the project narrative reported in Section 7.4.2, seven key tailoring events were identified. These events are now formally identified by number, and additional detail of each of these tailoring events is provided in Table 17.

Table 17 - Summary of Observed Tailoring Events in Research Cycle 3

Tailoring Event Number	Nature of Tailoring Event
1	Selection of the "Custom Application Development" Delivery Process as the initial “Methodology-as-Documented” based on an understanding of the project’s characteristics known at that time. Despite the TeleTransform program making extensive use of packaged software, this Delivery Process was chosen over a package-specific methodology in recognition of the large amount of custom development work required to integrate the packages with each other and into the surviving legacy applications. When asked why the choice was made to select CAD as the base method rather than one which focused more on package implementation, ME-1 replied that “*It’s true that OzTel expected us to implement a number of packages, but it was even more important to them that they got the expected business capability delivered. You’ve got to remember that one of the catch phrases for the program was to provide a “one click” experience. Key to doing this was developing the integration to tie all of these packages together*”. He further commented that “*…the assessment was that there was more work involved in building custom interfaces between the packages, and so CAD was selected*”.
2	Modification to the initial Methodology-as-Documented. The initial Methodology-as-Documented was selected as the "best fit" for the project as it was then understood. However, it required supplementation with work

	products from other Delivery Processes to ensure that the contractually obligated deliverables could be developed. In part, this was required because of the Methodology-as-Documented's focus on custom development when much of the work in the TeleTransform program was in the configuration and customisation of packaged software. In addition, an internal Sysco mandate for the incorporation of the Quality Assurance Method (QAM) into the delivery approach for all complex Information Systems projects worth more than $5 million necessitated further change. The outcome of this was the development of an instance of the Methodology-as-Anticipated focussing on the **program** level. As an indication that the need for this tailoring was to some extent, foreseen, ME-8 in response to a question about whether or not he knew that QAM would need to be incorporated into the tailored ISDM, commented that "*Yes, we knew about the mandate. But it's only since the details have become clearer that the extent of the need became known*". He went on to say that he more or less knew about it coming into the project, but that "*…we're only trying to define the approach now, and to get agreement for that with OzTel*".
3 (multiple)	Modification of the program-level initial Methodology-as-Anticipated to produce additional program-level instances of the Methodology-as-Anticipated. These instances of tailoring principally related to: • Adding further work products; • Eliminating work products that were deemed to be no longer required; • Changing the scope and purpose of previously identified work products; and • Moving the creation of deliverables and work products to different phases. Each of the tailoring events described here was a considered, pro-active response to a change in project conditions. For example, the inputs into the "Release Planning and Specification" deliverable changed significantly when a dependency on OzTel to define the requirements which formed the

	basis of the releases' scope, was identified. Similarly, the inclusion of the OzTel Requirements Definition Document as an input was a response to clarifying scope. Each of the work products added to the methodology acted to refine and more precisely clarify the scope of the release. In a program of the size of this, one of Sysco's major concerns is to provide certainty around what it is that they are obligated to deliver. As ME-4 put it, one of the roles of an ISDM is to "…*provide some certainty that we know what we have to deliver, and if possible, to get agreement with the customer on that. Not the sort of contractual level understanding, but more fine grained. So you could say one of the roles of method is to try to contain or control scope and commercial risk*". By asking OzTel to supply an RDD, Sysco was "…*getting them to be clearer about what they want*". When asked why, if gaining this understanding is so important, it isn't included as a standard part of the Sysco ISDM, ME-4 replied that "…*not every project we do is for OzTel. I mean, it's a big account, but it still doesn't mean it has a method tailored for it. So this is one of the things that happens at the start*". Finally, on querying whether need for the tailoring response was anticipated or not, ME-4 remarked that "*We don't work in isolation when we tailor the method. Particularly in the planning phase. We deal with our sales team for instance, so we get a "heads up" as to what we're on the hook for and so we can plan for it*".
4 (multiple)	Modification of the initial program level Methodology-as-Anticipated to produce an initial (and subsequent) Customer Service Assurance domain-specific instances of the Methodology-as-Anticipated. The program level Methodology-as-Anticipated provided a high level view of how to deliver the various contractual obligations, and ensured that cross domain requirements and dependencies were identified. However, this program level Methodology-as-Anticipated required decomposition to the domain level where the development work was being performed. When asked about this, ME-4 replied that "*This is a VERY LARGE program of*

work. So tailoring of the method happens iteratively. We start out knowing what the contract says we have to do, then select a Delivery Process to base stuff on. Then find gaps and fill them with stuff from other Delivery Processes. And often that's as far as you'll have to go." He went on to say that that wasn't the case here because "*It's too big. Too complex for that. We've got multiple releases over many years. We've got multiple functional domains in each release. We've got multiple packages being implemented by multiple sub-contractors. And the subbies have varying levels of maturity as far as method is concerned*".

He additionally commented that "*Trying to handle all of this complexity in one round of tailoring is impossible. So we come up with a high level view of it, you know, like a program level view. Then we identify those bits that have to be produced in each release, and then those that have to be produced for each domain and each component, and build up the detail that way*".

The same types of tailoring observed in relation to tailoring event 3 were observed here:

- The addition of further work products as the domain team performed a deeper dive into planning for their work, and a better understanding of the work products required to support their work emerged;
- Changing the scope of previously identified work products. For example, what had been identified in the program level Methodology-as-Anticipated as "Test Plan Packages", were split into multiple work products, each of which had a small, well-bounded scope; and
- Moving deliverables and work products to different phases. For example, the "System Availability Plan" and "Application Recovery Plan" work products had both been placed in the "Detailed Design" phase in the program level Methodology-as-Anticipated". However, as the more detailed planning work got underway within the Customer Service Assurance domain, it became clear that

	development of these work products would need to be deferred to the "Construct" phase as their inputs were not going to be ready in the "Detailed Design" phase. In explaining the need to reposition these into another phase, ME-4 explained that "…*while a component level version of this might be ready then, we have to roll it up into a domain version and then into a release version, and that certainly won't all be ready then. So then endpoint - the delivery if you like - of the work product is moved into the Construct phase*".
5	Development and execution of a domain level Methodology-in-Action. When the domain level Methodology-as-Anticipated was relatively mature, time pressures forced upon the management of the Customer Service Assurance domain by Sysco resulted in development activities commencing when all aspects of planning had not been completed. As the Customer Service Assurance domain Methodology-as-Anticipated was being reviewed for suitability for execution in support of development work, it was found that a previously identified input into the domain level architecture, the OzTel Domain Level Architecture, would no longer be available. The result of this lack of availability of a previously identified input was a rapid assessment by the Method Exponent of the impact on OzTel of not being supplied with this input work product. This resulted in a reactive change to remove the input work product from the Methodology-in-Action which was then executed. This change was justified by RITA-4 when he said that "… *it's not like this domain in this release is operating in a vacuum. We're sort of fenced in by the packages being used by us and the other domains in the release. You know, the interfaces they offer. And the other domains are specifying their architecture as well. Plus we still have the overall end state architecture to work to*". As a consequence of these time pressures, tailoring decisions which resulted in an executed Methodology-in-Action tended to be reactive. The same types of tailoring observed in events 3 and 4 were observed here.
6	Tailoring of the domain level Methodology-in-Action to generate an additional instance of the Customer Service Assurance domain

	Methodology-as-Anticipated. As additional planning within the Customer Service Assurance domain occurred, additional information drove subsequent tailoring efforts and produced further instances of a domain-level Methodology-as-Anticipated. This information came about as additional planning within the Customer Service Assurance domain for the initial release of the TeleTransform program occurred, and as ISDM tailoring and domain level method execution occurred. For example, a number of additional work products were added to the Customer Service Assurance Methodology-in-Action, including the Customer Service Assurance Domain "Package Integration Model" and "Service Profile". Subsequent reflection on the intent of these work products resulted in them being added to a new instance of the Customer Service Domain Methodology-as-Anticipated. When queried about this, ME-1 commented that "*While work had started, there was still planning going on. There were still gaps in knowledge that had been filled by assumptions and experience. But work was occurring to actively close those gaps and as more information came to light it sometimes, not always but sometimes, drove more changes to the method*".
7	Tailoring of the Customer Service Assurance domain-level Methodology-in-Action to generate an additional instance of the program level Methodology-as-Anticipated. This occurred in parallel with tailoring event number 6 described above. The additional information and lessons learned which came to light as the program progressed and as development was underway in the Customer Service Assurance domain was fed back into the domain level Methodology-in-Action. These tailoring events focused on refining the program level Methodology-as-Anticipated to incorporate the lessons learned and to better align the documented form of the methodology with practice. As an example of this, the addition of the "Package Integration Model" and "Service Profile" work products will be used. After reflection on their intent

	and use, it was realised that such work products were required at the TeleTransform program level (in order to assist in the development of release level deliverables) as well as at the Customer Service Assurance domain level.

7.4.4 Analysis Outcomes - Initial Classifications

Each observed key tailoring event previously identified can be described by documenting the initial and final states of the ISDM, and the type of transition observed between those states. Each of the key tailoring events identified in Table 17 above is now classified and described in detail using the methodology state and form of tailoring terminology, in Table 18.

Table 18 - Classification of States and Transition Type in Research Cycle 3

Tailoring Event Number	Methodology States		Form of Tailoring	Classification of Tailoring Event
	Initial State	**Final State**		
1	Methodology-as-Documented Library	Methodology-as-Documented	Contingent	This tailoring event related to the selection of the "Custom Application Development" (CAD) Delivery Process as the program level Methodology-as-Documented based on an understanding of the type of project and on the features, influences and constraints of the project which were known at that time. This was a proactive response to one of the project's features, a very large amount of custom development work required to integrate the packages with each other and into the surviving legacy applications. It can be considered pro-active because, as ME-4 commented "*For something like this, you know, we've done it before. We've got lots of experience with SAP for instance. So you know when you're engaged, that, especially if it's integration of packages, that you're probably going to have to configure. So this kind of makes you sensitive to the need and if it isn't expressed, to ask*", demonstrating the understanding of the project that existed at that point in time led ME-4 to

				anticipate and plan for tailoring of the Methodology-as-Documented. As such, it represented a form of **contingent** tailoring.
2	TeleTransform Program Methodology-as-Documented	TeleTransform Program Methodology-as-Anticipated	Contingent	This tailoring event resulted in modification of the initial Methodology-as-Documented in order to align the commercial objectives of the program with the approach to development. Gaps in the Methodology-as-Documented were addressed by selecting work products from other Sysco Delivery Processes and including them in a tailored version of the Program Methodology-as-Anticipated. The mandatory inclusion of Sysco's Quality Assurance Method (QAM) also resulted in tailoring. The outcome of this was the development of an instance of the Methodology-as-Anticipated focussing on the **program** level. These changes were undertaken in a pro-active, considered manner in response to known project characteristics, and can thus be considered examples of **contingent** tailoring transitions.
3	TeleTransform Program	TeleTransform Program	Contingent	These multiple tailoring events related to the modification of the program level initial Methodology-as-Anticipated to

	Methodology-as-Anticipated	Methodology-as-Anticipated		produce additional program level instances of the Methodology-as-Anticipated. The addition of the RDD to the program level Methodology-as-Anticipated was a considered, pro-active response to perceived shortcomings in the Methodology-as-Anticipated and to known or assumed project conditions, and as such, can be considered as an example of **contingent** tailoring.
4	Program Methodology-as-Anticipated	Customer Service Assurance Domain Methodology-as-Anticipated	Contingent	These multiple tailoring events related to the modification of the program level initial Methodology-as-Anticipated to produce an initial (and subsequent) Customer Service Assurance domain-specific instances of the Methodology-as-Anticipated. The program level Methodology-as-Anticipated provided a high level view of cross domain requirements and dependencies and led to an understanding of how to deliver the various contractually obligated artefacts. However, this methodology was described at too abstract a level to be effectively executed. In order for it to be of use in guiding and managing the development effort within a domain, it required decomposition to the domain level where the

				development work was actually being performed. Once again, each of the tailoring events observed here was a considered, pro-active response to changes in the project's conditions and could thus be considered to be an instance of **contingent** tailoring.
5	Customer Service Assurance Domain Methodology-as-Anticipated	Customer Service Assurance Domain Methodology-in-Action	Improvised	This tailoring event related to the development and execution of a Customer Service Assurance domain level Methodology-in-Action. The nature of the tailoring of the Methodology-as-Anticipated which led to the Methodology-in-Action marked this as an **improvised** tailoring event because: • The response drew heavily on the knowledge and prior experience of those involved in the tailoring process; • The tailoring was in response to a change in the project, namely the non-provision of the CSA architecture document; and • The tailored method was to be executed immediately in the support of development work.
6	Customer Service Assurance Domain	Customer Service	Contingent	This tailoring event related to tailoring of the Customer Service Assurance domain level Methodology-in-Action to

	Methodology-in-Action	Assurance Domain Methodology-as-Anticipated		generate an additional instance of the Customer Service Assurance domain Methodology-as-Anticipated. The addition of these work products to the Customer Service Assurance Methodology-in-Action to form a new instance of the Customer Service Assurance Methodology-as-Anticipated was a considered, pro-active decision, and can thus be characterised as a **contingent** tailoring event because rather than being executed immediately, the newly tailored version was positioned as a starting point for the Customer Service Assurance domain's future tailoring efforts. When asked about this point, ME-1 commented that "*…method isn't linear. You know, they often evolve in all sorts of directions. So yes, this CSA method WAS being executed, but we went and modified it*" and ME-1 explained the motivation for this as "*…one consideration for us was we wanted to make sure that this knowledge was folded back into the CSA method so that it wasn't lost in later releases*".
7	Customer Service Assurance Domain Methodology-in-	TeleTransform Program Methodology-	Contingent	This tailoring event related to tailoring of the Customer Service Assurance domain level Methodology-in-Action to generate a further instance of the TeleTransform program

	Action	as-Anticipated		level Methodology-as-Anticipated. The addition of the "Package Integration Model" and "Service Profile" work products is an example of this tailoring. Reflection on their intent and use led to the realisation that such work products were required at the TeleTransform program level (in order to assist in the development of release level deliverables) as well as at the Customer Service Assurance domain level. Consequently, a considered decision was made to add these work products to the TeleTransform program level Methodology-as-Anticipated in a further example of **contingent** tailoring.

7.5 Reflect

Reflection centred on identifying which of the possible transitions proposed in CF_1 (Section 4.3.1), were observed thus providing further validation of the Conceptual Framework (CF_3) presented in Section 6.5.4.

As was the case in the two previous cycles of research, evidence was obtained in this cycle of research to support the proposition that an ISDM exists in three states (Methodology-as-Documented, Methodology-as-Anticipated and Methodology-in-Action) and that transitions between pairs of states can occur in one of two ways (contingent tailoring transitions, or improvised tailoring transitions).

7.5.1 Reflection on Utility of Alternative Models

The seven key tailoring events observed in this cycle of research could have been interpreted using Appropriation as the analytical lens. Any analysis of this kind, however, would have been at such a high level as to result in no meaningful information being gleaned as to the process of tailoring. In effect, the complex process of ISDM tailoring revealed in this case would have been entirely subsumed within level 2 of the Model of Technology of Appropriation and not provided and insight into ISDM tailoring.

Opportunism was previously identified in Section 2.5 as an alternative construct with which to view ISDM tailoring. Of the seven tailoring events identified in this case, only one of them (event 5 in Table 17) could, by their nature, have been analysed using opportunism as the lens. Had this analysis been done, only a partial fit with the observed events would have been achieved, as key to each of these events was the leveraging of the practitioners' knowledge and experience. Such a feature is not a characteristic of opportunism, and as such, would have been lost.

As was the case in comparable sections of the two previous cycles of research, the events described in Section 7.4.4 could not be interpreted using Situated Action as the analytic lens, at least not in the context of the emerging model of ISDM tailoring. This was because Situated Action is more concerned with understanding why events are occurring, whereas the focus of this study is on developing an understanding of what happens when ISDM tailoring occurs. In addition, when viewing change through the lens of Situated Action, there may be a separation in time between the development and execution of a response, whereas in an improvised response, the development and execution of a response are simultaneous, or very tightly connected in a temporal sense. In the current cycle of research, a key feature of that event ultimately categorised as "Improvised" was the tight coupling between the stimulus for change, and the change itself.

Finally, all seven key tailoring events described in Section 7.4.4 were able to be categorised using the constructs contained within CF_1. No tailoring events were observed in this case which did not fit the emerging model of ISDM tailoring.

Reflection also provided an opportunity to identify data which did not fit the proposed model. Whilst being sensitive to this possibility, data collected in this case failed to provide any evidence to support the identification of additional states or types of transitions beyond those proposed in CF_1 and subsequently validated in CF_2 and CF_3. The further validated Conceptual Framework ($CF_{4)}$ is presented in Section 7.6.2.

7.5.2 Summary of the Application of Structured-Case

Section 3.4.2.1 introduced the structured-case framework and described how it includes a planning phase, a data collection phase, and data analysis phase, and a reflection stage (Carroll and Swatman 2000). Appendix L summarises the major activities undertaken within each of the structured-case phases.

7.6 Discussion

7.6.1 Implications for Theory

Sections 5.6 and 6.6 of this thesis provided evidence to support the model of ISDM tailoring proposed within CF_1 (documented in Section 4.3.1**)**. The case described within this chapter provides additional evidence to support elements of CF_1 and further revises the Conceptual Framework (CF_3) which was presented in Section 6.5.4.

7.6.1.1 Identification of States of ISDM

Observations from this cycle of research have provided additional evidence to support the proposition that an ISDM may exist in one of three states, with each of the three proposed states having been observed in one or more of the key tailoring events in this case. Whilst each tailoring event had a common structure (an initial state, a final state, and a transition between the two), there were differences in the initial and final states from event to event, and also in the type of transition which occurred between them.

7.6.1.2 Identification of Transitions Between States of ISDM

The research described in this thesis proposes a model to describe transitions between the states in which an ISDM can exist. This model differentiates these transitions into two types – contingent and improvised tailoring events.

CF_1 proposed that 18 transitions could occur between the 3 proposed states in which an ISDM may exist. Observations made in the course of examining three case projects have provided evidence to support the existence of a number of those proposed transitions.

In the case of this cycle of research, a transition not seen in the two previous cycles of research was observed – a contingent tailoring event between the Methodology-in-Action state, and the Methodology-as-Anticipated state.

7.6.2 Validating the Conceptual Framework

Key findings in each Structured-Case research cycle are encapsulated in a conceptual framework which evolves throughout the research. This framework captures the insights drawn from each cycle of research, and also seeds the next cycle of research. Figure 23 below represents the Conceptual Framework, revised to accommodate the observations from this case. In this diagram a dashed red line indicates a transition between states executed in a **contingent** manner which has been observed in at least one of the two previous case projects, whilst a dashed blue line indicates a transition between states executed in an **improvised** manner which has been observed one of the two previous case projects. Solid lines represent transitions proposed in CF_1 which were observed for the first time in the current case project. In this case, a single transition which had not been seen in the two previous cycles of research was observed: a transition between the Methodology-in-Action and the Methodology-as-Anticipated, executed in a **contingent** manner.

This cycle of research observed only one new transition (a contingent tailoring transition between the Methodology-in-Action and Methodology-as-Anticipated states). It is therefore reasonable to suggest that a degree of saturation of the understanding that is accessible using the data collection and analysis techniques employed in the study has been reached (Strauss and Corbin 1998).

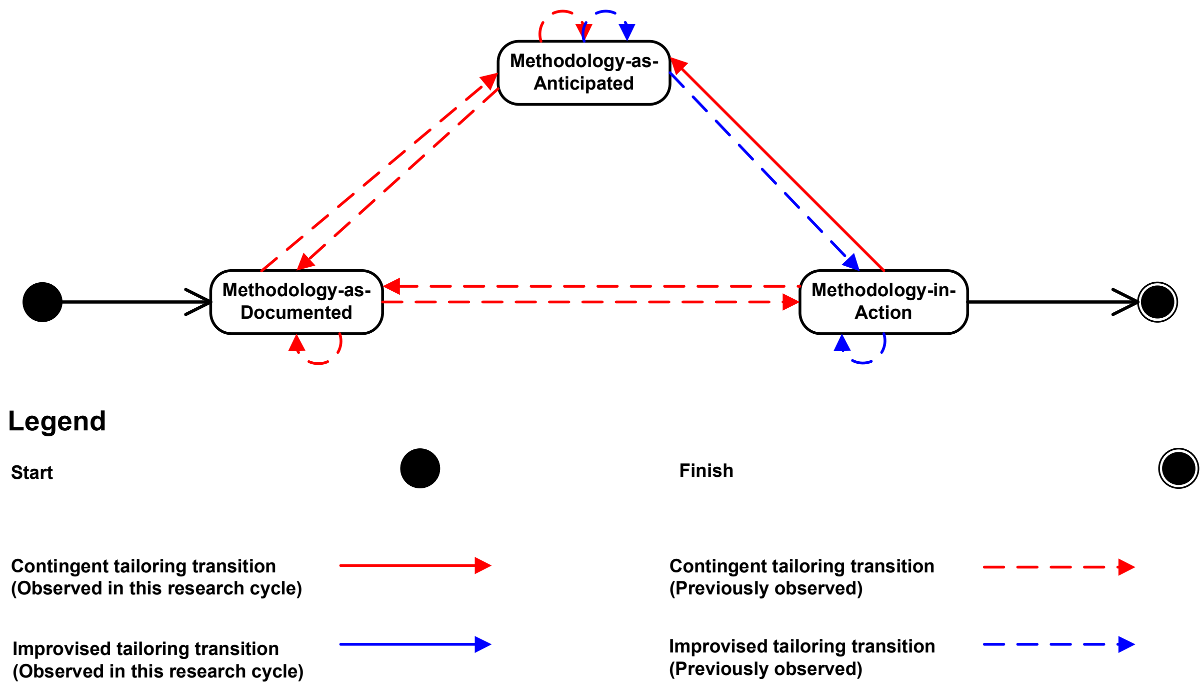

Figure 23 – Partially Validated Conceptual Framework (CF_4)

7.7 Chapter Summary

This research cycle has investigated the tailoring of an ISDM on a third complex, commercial Information Systems project. Following initial planning (Section 7.2), a variety of types of data were collected (including method documents, notes of observations of MAWs, and interviews with ISDM tailoring participants) using a number of different methods for data collection (Section 7.3). Similarly, a number of different methods of data analysis were employed (Section 7.4), thus strengthening the theory being built (Eisenhardt 1989; Neuman 2003).

The Conceptual Framework (CF_4) presented in Section 7.6, addresses research question two ("*To what extent does the synthesised model of ISDM tailoring reflect contemporary practice of ISDM tailoring as conducted in large, commercial projects?*". It accomplished this by undertaking further empirical validation of the notion and utility of the states in which a methodology may exist with a particular emphasis on searching for examples of previously unobserved transitions. In particular, it focused on analysing for the first time, examples of contingent tailoring transitions between the Methodology-in-Action and the Methodology-as-Anticipated.

The conceptual framework initially proposed in Section 4.3.1 and validated in Sections 5.6.2 and 6.5.4 has been further validated to reflect observations from this cycle of research (Section 7.6). Validation of the essential constructs of CF_1, including the three proposed states in which an ISDM can exist, and the two types of transitions between these states, has been provided by the key tailoring events which were observed. Additional instances were observed in this cycle of research of the subset of the many transitions identified in CF_1 observed in the preceding cycles of research. Only one new type of transition was observed in this cycle of research, suggesting that a degree of theoretical saturation has been achieved.

It should be noted that the partially validated Conceptual Framework (CF_4) does not include a number of the transitions between ISDM states which were proposed in the Initial Conceptual Framework. The failure to observe these transitions should however, not be taken as evidence that they cannot exist. Rather, it provides an opportunity for further research, looking at additional types of projects, performed by different delivery organisations for different clients.

8 CONCLUSION

8.1 Introduction

This chapter summarises the program of research, and its findings, reported in this thesis. It is structured as follows. A review of the Research Questions, and summaries of the findings in the context of those questions, is presented (Section 8.2). An overview of the conclusions is presented in the form of the "Model of Methodology Tailoring" which is a key outcome of the research (Section 8.3). The contributions to knowledge which the research has provided are then discussed (Section 8.4), from the perspective of contributions to IS theory (Section 8.4.1), and contributions to IS practice (Section 8.4.2). Some reflections on the findings of the study are provided (Section 8.5). Limitations of the approach used to conduct the research are identified (Section 8.6) and potential areas for future research, which have been highlighted by the study, are reported (Section 8.7). Finally, some closing observations with respect to the research are presented (Section 8.8).

8.2 Research Summary

The tailoring of an ISDM is an important early step in the development of an IS as it ensures alignment of the ISDM with a project's features, thus increasing the likelihood that commercial obligations (hardware, software, services, documentation) are delivered on time, on budget, and to client satisfaction.

Much of the previous research into the application of ISDMs has been criticised for shortcomings in research design (see Section 2.4.7), with the criticisms centring on the data collection methods used, the selection of participants involved in the research, and on the type of problems examined. This reflects a gap in the somewhat sparse, practice-based research undertaken, in which the application of ISDMs in large, complex commercial projects was the focus of the study (Bansler and Bødker 1993; Kautz, Hansen et al. 2004; Madsen and Kautz 2002; Vigden, Madsen et al. 2004). Furthermore, research into the use and tailoring of ISDMs in the last 10 years or so has tended to focus more on examining how "agile" methods are used rather than on how those ISDMs referred to variously as "heavyweight", "structured", or "plan driven" are used, with the need for such "agile" methods to be tailored to suit the "particular development context" highlighted (Fitzgerald, Hartnett et al. 2006; Karlsson and Ågerfalk 2009a). Whilst "agile" methods are widely considered suitable only in small to medium sized projects (Highsmith and Cockburn 2001), regardless of the size and level of complexity of the project, the question of how an ISDM is tailored on a commercial project is still of relevance and largely unanswered.

This research project was designed to address the overarching question "***Why are technologies in use different to technologies as designed?***". In order to do this, two research questions were defined, as revisited below. Providing answers to these research questions contributes to providing an answer to the overarching question.

8.2.1 The Research Questions

8.2.1.1 Synthesising an Initial Model of ISDM Tailoring

The first research question was "*What are the components of a model of ISDM tailoring that can be synthesised from the literature, expert opinion and available theoretical foundations?*". The literature has been explored in Chapter 2, whilst Chapter 4 described the synthesis of a model of ISDM tailoring (reproduced as Figure 24). This synthesised model was founded on Fitzgerald's "Framework for the IS Development Process" (1998b) and has been extended by drawing on the research themes, literature, the researcher's theoretical foundations, and expert opinion (based on interviews with experienced ISDM tailoring practitioners, and observation of laboratory-based workshops involving experienced practitioners, undertaken in a Pilot Study). The extensions included the addition of a third state ("Methodology-as-Anticipated"), and that transitions between pairs of states can be categorised as being of two types: pro-active transitions, planned in advance of their execution, based on known or assumed knowledge of the project, referred to as contingent tailoring; and reactive transitions between pairs of states, representing an immediate, or close to immediate response to emergent project conditions, referred to as improvised tailoring.

This model, called the Initial Conceptual Framework (CF_1) in the thesis and shown again in Figure 24, addresses research question one.

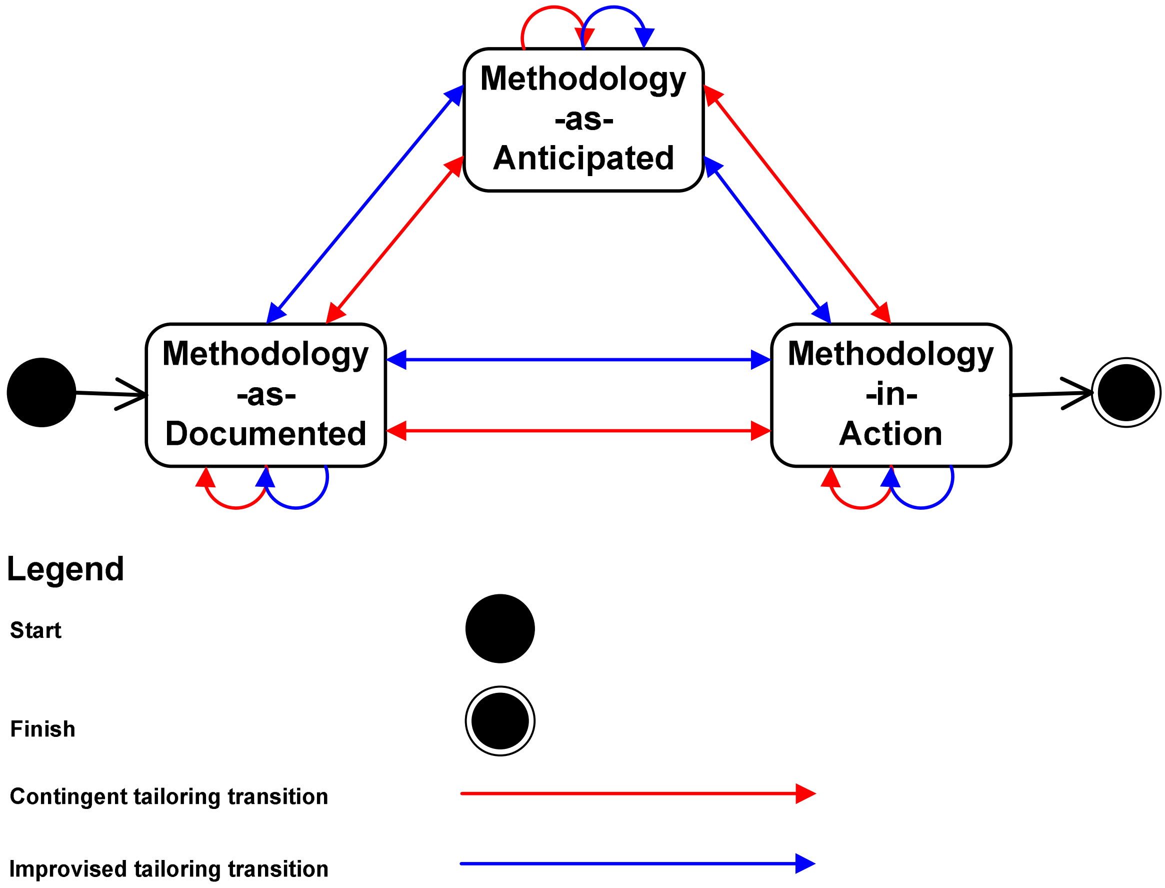

Figure 24 - Initial Conceptual Framework (CF_1)

8.2.1.2 Comparing the Synthesised Model with Practice

The second research question, "*To what extent does the synthesised model of ISDM tailoring reflect contemporary practice of ISDM tailoring as conducted in large, commercial projects?*", sought to compare the understanding of ISDM tailoring contained within the synthesised model (first research question), with the practice of ISDM tailoring on complex, commercial projects.

Contemporary practice of ISDM tailoring was examined in case studies of three complex commercial projects, reported in Chapters 5, 6, and 7. The case projects were selected as they offered the opportunity to capture insights into ISDM tailoring. Rather than attempting to ensure all possible variations in the types of project and instances of tailoring were covered, the intention was to develop a deep understanding of ISDM tailoring in selected cases. As such, theoretical rather than representative sampling was applied when selecting cases. When applying theoretical sampling, cases are selected because "…they are particularly suitable for illuminating and extending relationships and logic among constructs" (Eisenhardt and Graegner 2007) and because they allow for replication or extension of emergent theory (Eisenhardt 1989), which is appropriate given the aims of this research.

The research utilised a variety of qualitative data collection techniques including observation of tailoring sessions, interviews with ISDM tailoring practitioners and ISDM tailoring session participants, and document collection.

Data analysis employed coding of data (specifically interview and ISDM tailoring session transcripts), and document analysis. Throughout this process, concepts from the literature represented in CF_1 were tested, confirmed, and extended where necessary.

Findings from the three case projects were analysed, which validated the Conceptual Framework describing ISDM tailoring at the conclusion of each case project, so building understanding sequentially. Sections 5.6.2, 6.5.4, and 7.6.2 contain validation of parts of CF_1. The major outcome of the qualitative research phase has been a model of ISDM tailoring, the "Model of Methodology Tailoring", which integrates the understanding of the process derived from a review of the literature and findings from the Pilot Study (and encapsulated in CF_1 reported in Section 4.3.1) with observations of practice reported in Chapters 5, 6, and 7. Observed practice has confirmed the existence of the three postulated ISDM states, and the existence of 10 of the postulated 18 transitions (see further discussion in Section 8.3).

This program of qualitative research validated the synthesised model and so addressed research question two.

8.2.1.3 Identifying Areas for Improvement of Practice

Whilst not explicitly framed as a research question, identification of potential improvements to the practice of ISDM tailoring was a consideration throughout the study. Developing an understanding of the tailoring of an ISDM as it occurs in practice offers opportunities for improvement of the process, as practitioners may have "…assimilated good practices and techniques" (Fitzgerald 1994b). Additionally, examining the use of ISDMs in practice offers the opportunity to enhance understanding of how ISD is actually conducted in practice, how ISDMs are actually used, and to what degree they are used as proposed in the literature (Madsen and Kautz 2002). To that end, the validated Conceptual Framework, documented in Section 7.6.2, provides a means to understand how ISDMs are *actually* tailored rather than how they have been *assumed* to be tailored, and affords opportunities for the identification of areas where improvements to documented processes can be made. This is discussed further in Section 8.4.2.

8.3 Conclusions – The Model of Methodology Tailoring

The motivation for this research was to develop an understanding of how ISDMs are used in practice on complex, commercial projects and to then use that understanding as the basis for identifying opportunities for improving that process. Central to this is the Model of Methodology Tailoring (MMT) shown below in Figure 25.

This model integrates knowledge of the tailoring of an ISDM drawn from the literature and expert opinion, with the theory induced from three case projects studied in this research project. The framework was developed by the researcher, with inputs from literature, experts in the field filtered through the researcher's own theoretical foundations, and from the program of qualitative, case-based research. Despite some minor involvement in the tailoring of the ISDM in cases 1 and 2 (see Sections 5.3.1 and 6.3.2), every effort was made to minimise the researcher's influence.

The framework represents ISDM tailoring through the use of two key concepts: **states** in which an ISDM may exist, and **types** of transitions between these states.

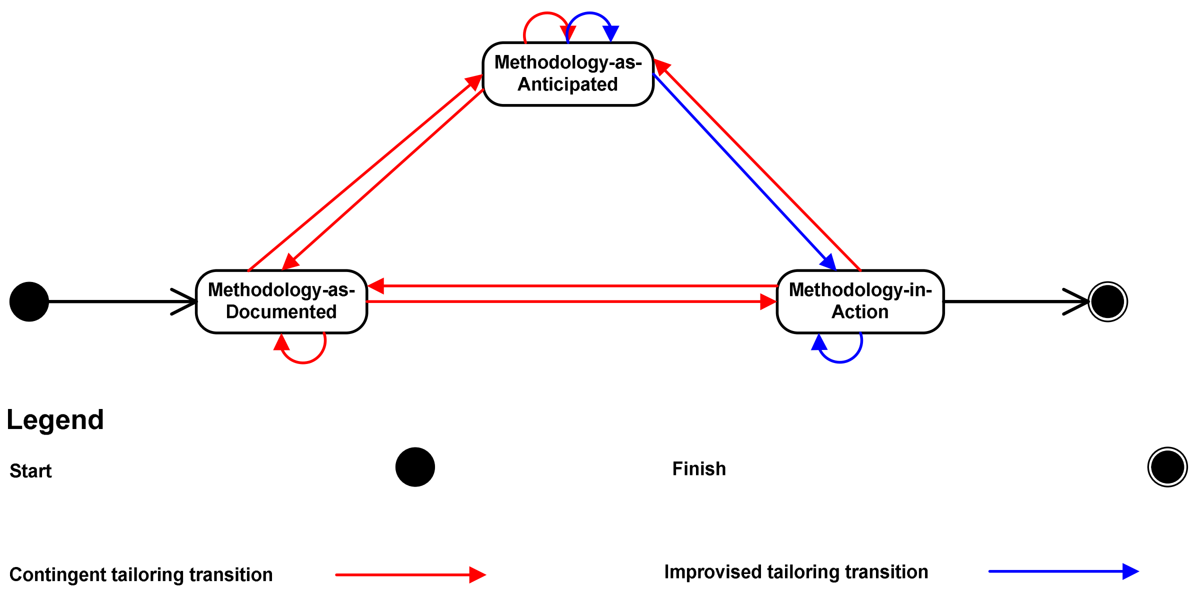

Figure 25 – Practice-Based Model of Methodology Tailoring (MMT)

Evaluation of the Model of Methodology Tailoring against existing models, such as those of Fitzgerald (1998b) and Brinkkemper (1996) as a point of comparison, supports the assertion that the model constitutes a significant contribution to the understanding of ISDM tailoring as it applies in practice.

Reflection on the Model of Methodology Tailoring indicates that perceptions about ISDM tailoring reported in some of the previous research are ill-conceived, at least in-so-far as these perceptions concern tailoring of ISDMs as it occurs in practice. Previous models have tended to view tailoring as moving an ISDM directly from an "as documented" state to an "in use" state. The present research has confirmed that tailoring frequently takes place via a third, intermediate ISDM state, termed in this research the "Methodology-as-Anticipated". Further, representation of the tailoring process as consisting of a single type of transition between two states is not supported by this research. Instead, two distinct types of transition have been confirmed – contingent tailoring and improvised tailoring.

Previous research has also not explicitly recognised that iteration can occur during the development of a tailored ISDM on a complex project (i.e. that tailoring can, for example, move the ISDM from one version of Methodology-in-Action, to another version of Methodology-in-Action), nor has it recognised that transitions between pairs of ISDM states can occur in two different ways: **pro-actively** in response to known or assumed project conditions, and **reactively**, in response to emergent conditions which require an immediate response.

8.4 Conclusions - Contributions to Knowledge

The contributions made by this research project can be categorised as contributions to IS theory, and contributions to practice.

8.4.1 Contributions to IS Theory

The research described in this thesis contributes to IS theory in the following ways:

- The extension of Fitzgerald's (1998b) description of the tailoring of an ISDM from two states to three through the inclusion of a state intermediate between the "Methodology-as-Documented" and the "Methodology-in-Action", referred to as the "Methodology-as-Anticipated" represents a significant contribution to theory. As discussed in Section 8.3, the present research has confirmed that tailoring frequently takes place via this third, intermediate ISDM state. Whilst the concept of a third state has been raised previously (e.g. by Karlsson and Ågerfalk (2009b)), it has not previously been formalised and described.
- Definitions have been provided of the three states in which an ISDM can exist.

- Representation of the tailoring process as consisting of a single type of transition between two states is not supported by this research. Instead, two distinct types of transition have been confirmed:
    - o Pre-planned or pro-active tailoring taking into account known or assumed characteristics, referred to as CONTINGENT tailoring; and
    - o Spontaneous, reactive tailoring in response to emerging conditions, referred to as IMPROVISED tailoring.
- It has been identified that recursive transitions can occur during the development of a tailored ISDM on a complex project (i.e. that tailoring can, for example, move the ISDM from one instance of the Methodology-in-Action state, to another instance of the Methodology-in-Action state)
- A Model of Methodology Tailoring incorporating the different states and transitions between them (see Figure 25 for details of the Model of Methodology Tailoring), has been developed. The model represents a reconceptualization of ISDM tailoring, grounded heavily in practice.

A number of publications were developed during the course of the research. These are documented in Appendix O.

8.4.1.1 Theoretical Implications

In Section 2.5, a number of models which might be used to explain ISDM tailoring were presented, categorised as either describing tailoring planned ahead of the time of execution (i.e. pro-active tailoring), or tailoring in which conception and execution of the tailoring occur back to back, unseparated by time (i.e. reactive tailoring).

From the set of models presented in Section 2.5, contingency and improvisation were chosen as the most suitable with which to model pro-active and reactive tailoring respectively. The selection of these models was described in Section 2.5.3.

Many of the observed transitions in the three case studies were categorised as representing examples of contingent tailoring. These transitions highlighted the following characteristics of a contingent approach to tailoring:

- Each development situation is unique due to the variety of project characteristics such as size, technology, task (Weill and Olson 1989), and that consequently there is no single “best” way to undertake a project (Fitzgerald 1994a); and

- Organisational context and structure must be a good fit for the characteristics of the project (Umanath 2003).

A number of the transitions observed in the three case studies were categorised as being improvised in character. Such transitions highlighted characteristics typical of improvisation identified by a number of authors, including the:

- role of expertise and experience (Suscheck and Ford 2009; Vera and Crossan 2005);
- convergence between conception and execution (Vendelø 2009); and
- role of learning from, and adapting to, circumstances of the project (Ciborra 1999).

The observation of these characteristics in the case studies supports and strengthens those theories previously reported in the literature and represents a significant contribution to the body of knowledge pertaining to ISDM tailoring.

8.4.1.2 Utility of Alternative Lenses

Brief consideration is now given to whether the models presented in Section 2.5 and which were not incorporated into the Initial Conceptual Framework (CF_1) may have fitted the data collected in the three case studies.

Appropration, which was one of the models identified in Section 2.5.2, refers to the process by which users take possession of a technological innovation over time (Carroll 2004). The Model of Technology Appropriation (Carroll, Howard et al. 2002) presents a model containing three levels, with which to describe technological appropriation. However, the levels described in the model are at a very high level, focusing on adoption or rejection of the technology as designed, exploration of the technology (including user modification), and long term experience in the use of the technology. These levels do not assist in providing an understanding of the process of ISDM tailoring and so appropriation was not selected as a model with which to analyse collected data.

Opportunism was also considered as a potential lens through which to analyse data collected during the study. Within the context of design, opportunism is a problem solving strategy in which the state of the design problem and the environment in which that problem exists causes change in the goals and activities of the designers (Khushalani, Smith et al. 1994, p.18). Designers adopt new, or modify existing, approaches to solving a problem as a result of the state of the problem and that of the environment studies (Guindon 1990; Hayes-Roth and Hayes-Roth 1979; Visser 1990, p.250). Where such changes are made, an opportunistic view sees them as not following another plan, at least not a conscious one, or one which is formally documented (Visser 1990, p.267). This contrasts with improvisation, where the knowledge and experience of the designers is leveraged. Since the collected data stressed the role of previous experience when tailoring an ISDM, opportunism was not seen as a viable model with which to analyse collected data.

Situated action was also one of the models identified in Section 2.5.2 as a potential lens through which to analyse data collected during the study. Situated action, like a contingency approach, represents a response to context. However, whereas contingency approaches attempt to control elements of context, situated action involves learning from and adapting to elements of context (Crossan 1998). In situated action, participants incorporate formal, documented procedures into local, informal routines, incorporating knowledge obtained from sources such as informal story-swapping among users (Tyre and von Hippel 1997). In this sense, situated action differs from improvisation, in that in an improvised response, the development and execution of a response are simultaneous, or very tightly connected in a temporal sense. Such is not necessarily the case with situated action where conception of a change obtained in such a setting, and the execution of the change may be separated temporally. In addition, situated action is best suited to developing an understanding of why particular actions are being taken, whereas the focus of this study is on developing an understanding of what happens when ISDM tailoring occurs. Data thus collected would not lend itself to analysis using situated action as a lens.

In summary, the chosen lenses of contingency and improvisation were appropriate lenses with which to view the data as they provided a good fit with the data. Moreover, analysis of the data collected in the Pilot Study and in the three case projects showed that the alternative lenses proposed in Section 2.5.2 did not reveal anything which could not be adequately explained using the concepts of contingency and improvisation.

8.4.2 Contributions to Practice

One of the aims of the project, whilst not explicitly articulated in the form of a research question, was to consider in what ways the refined understanding of ISDM tailoring might inform and improve the practice of ISDM tailoring.

As highlighted above, the significant findings which emerged from the project were the identification of a third, intermediate state in which an ISDM can exist, and recognition that transitions between pairs of states can occur in either a pro-active (contingent) way, or a reactive (improvised) way.

Comparison of the Model of Methodology Tailoring with existing models of ISDM tailoring enabled the identification of potential areas for practice improvement. Contributions to practice can be identified generally, and also specifically to Sysco.

From a general perspective, the recognition of the third, intermediate state in which an ISDM can exist, and the identification of two types of transitions between states should be incorporated into the documentation and training materials associated with any ISDM.

Specific contributions to the practice of ISDM tailoring, as it applies to Sysco, include the preparation of a report in which the findings of the study and recommendations for change will be provided to Sysco. Note that to maintain the anonymity of the participant organisation (Sysco) this cannot be included specifically within this thesis. Nevertheless, some broad observations on the parts relevant to Sysco are reported, as follows.

The Sysco approach to ISDM tailoring assumes that an ISDM exists in just two states – the "as documented" state, and the "as executed" state, referred to in this research as the "Methodology-as-Documented" and "Methodology-in-Action" respectively. The implications of the third state for Sysco, and similar organisations, is that the way in which they document their ISDM, and train staff in its use should be enhanced to include explicitly templates for this intermediate state, and protocols for the creation, modification and execution of ISDMs that explicitly include transitions to, and from this state in their ISDMs delivery process documentation and training materials.

Similarly, Sysco's current approach to tailoring does not identify that different types of tailoring transitions are possible. Observations of ISDM tailoring in the three case projects have shown that transitions between pairs of states can occur in either a pro-active or a reactive way. The implications of this for Sysco, and similar organisations, are that their in-house ISDMs should be modified to explicitly identify that different classes of tailoring can occur, and that such references should be supported by associated process documentation and guidelines. Further, training could include, explicitly, exemplars of each transition type, possibly drawing on samples taken from the case studies reported in the present research. The extent to which these recommendations for practice improvement could be implemented, evaluated and reported on in the thesis was small due time constraints.

However, the development of training and associated ISDM materials, the delivery of those training materials, and the assessment of whether or not these changes improved the ability of practitioners to perform their duties was outside the scope of the study.

8.5 Reflections

8.5.1 The Third ISDM State

This study has provided evidence to support the existence of a third state in which an ISDM may exist. This state, the Methodology-as-Anticipated, is intermediate between the Methodology-as-Documented, and the Methodology-in-Action, and has not previously been described in the literature.

Explanations of why this state has not been recognised and documented previously are at this stage speculative. Indeed this offers opportunities for further research, as discussed in Section 8.7. Possible explanations include:

- The intermediate state may only be seen in certain types of large, complex projects and either is not present at all, or is not apparent, in smaller, less complex projects. It may be that, regardless of how rigorously a project is planned, how assiduously information is gathered, or how carefully risks are managed, it is not possible to accurately foresee the future. Consequently, on large projects, conditions and information change in ways which drive the need for in situ tailoring;
- Much of the existing body of research into the use of ISDMs has not examined their use on live, commercial systems. This study, on the other hand, has focussed on such systems, and it may be that the choice of such case studies, in combination with the research approach adopted, has uncovered a previously unseen phenomenon; and/or
- The presence of the intermediate state may be unique to Sysco's use of its ISDM and thus specific to projects conducted by Sysco.

8.5.2 The Model of Methodology Tailoring

The Initial Conceptual Framework (see Section 4.3.1) presented a model of ISDM tailoring which postulated the existence of an extensive family of possible classes of transitions between the three states in which an ISDM might exist. In the course of this study, evidence was obtained to support the existence of ten of those transitions (see Figure 25).

At the conclusion of the study, evidence supporting the existence of the further eight postulated transition classes had not been obtained, as listed in Table 19:

Table 19 - Transitions Proposed in the Initial Conceptual Framework NOT Observed

#	Initial State	Transition Type	Final State
1	Methodology-as-Documented	Improvised	Methodology-as-Documented

2	Methodology-as-Documented	Improvised	Methodology-as-Anticipated
3	Methodology-as-Anticipated	Improvised	Methodology-as-Documented
4	Methodology-in-Action	Improvised	Methodology-as-Anticipated
5	Methodology-as-Anticipated	Contingent	Methodology-in-Action
6	Methodology-in-Action	Improvised	Methodology-as-Documented
7	Methodology-as-Documented	Improvised	Methodology-in-Action
8	Methodology-in-Action	Contingent	Methodology-in-Action

The absence of evidence supporting their existence should not necessarily be interpreted as meaning that these transitions do NOT ever occur. It may be, for example, that they occur infrequently, that they only occur for certain types of project or are only visible when using certain research methods.

In the following sections, reflections upon the failure to observe these transitions are offered. It is important to note that these explanations are speculative at this point but that they offer the possibility for future productive research.

8.5.2.1 Transition 1 – Methodology-as-Documented to Methodology-as-Documented (Improvised)

The three case projects examined in this research were all very large and complex Information Systems projects. On such projects, whilst it is in principle possible that updates could be made to the Methodology-as-Documented resulting in a new instance of the Methodology-as-Documented, there is always some planning undertaken up front, meaning it is unlikely that such a transition would occur in a reactive, improvised way.

8.5.2.2 Transition 2 – Methodology-as-Documented to Methodology-as-Anticipated (Improvised)

On a large, complex ISD project, initial steps in the project are likely to involve some element of information gathering and planning. In such situations, any initial episodes of tailoring of the Methodology-as-Documented to produce an instance of the Methodology-as-Anticipated is likely to be undertaken in a pro-active, contingent way. Hence, it is not surprising that that a transition between this pair of ISDM states in a reactive, improvised way was not observed.

8.5.2.3 Transition 3 – Methodology-as-Anticipated to Methodology-as-Documented (Improvised)

A transition such as this may occur in situations where lessons learned are fed back into the Methodology-as-Anticipated, resulting in the creation of a new instance of the Methodology-as-Documented. Undertaking such updates of the Methodology-as-Documented are typically not high priority actions during the course of development, and when they occur, are certainly not time critical. As a consequence, any instances of a transition between these pairs of states is likely to be undertaken in a pro-active, contingent manner, explaining the lack of observation of an improvised instance of the transition.

8.5.2.4 Transition 4 – Methodology-in-Action to Methodology-as-Anticipated (Improvised)

Potential explanations for the lack of observation of transitions of this type are at the present time, unknown. Whilst incorporating the lessons learned during IS development into the Methodology-as-Anticipated and Methodology-as-Documented is to be expected, time pressures on large, complex projects typically mean that such tailorings are undertaken in a reactive, improvised way. It may however be that rather than folding lessons learned into new instances of the Methodology-as-Anticipated, the Methodology-as-Documented is the focus for such updates. This is particularly likely to be the case where lessons learned are generically applicable to other releases of the same project, or other projects. Regardless of the actual underlying reason, this is an area for potential further research.

8.5.2.5 Transition 5 – Methodology-as-Anticipated to Methodology-in-Action (Contingent)

Large, complex IS development projects are frequently under significant time pressure. Whilst iteration of ISDM tailoring efforts is common (based on observations from the three case projects in this study), time pressures typically mean that development work continues whilst tailoring efforts occur in parallel with development, and the episodes of tailoring are reactive in nature and often likely to be executed immediately. The time pressure such projects are subject to at this point in their lifecycle tends to mean there is little time for reflection and planning, meaning that episodes of tailoring of this type tend not to be conducted pro-actively or in a contingent way.

8.5.2.6 Transition 6 – Methodology-in-Action to Methodology-as-Documented (Improvised)

A transition such as this may take place where lessons learned during the IS development project are identified as offering value for subsequent releases of the same project, or for other projects and are fed back into the Methodology-in-Action, resulting in the creation of a new instance of the Methodology-as-Documented. As explained in Section 8.5.2.3 above, undertaking such updates of the Methodology-as-Documented are typically not high priority actions during the course of development, and, when they occur, are certainly not time critical. Consequently, should such transitions between this pairs of states occur, it is likely to be undertaken in a pro-active, contingent manner, explaining the lack of observation of an improvised instance of the transition.

8.5.2.7 Transition 7 – Methodology-as-Documented to Methodology-in-Action (Improvised)

On a large IS development project, there is little likelihood of an ISDM being selected and executed immediately as the Methodology-in-Action. As discussed above, considerable planning is undertaken on large, complex IS development projects, resulting in the initial tailored forms of the ISDM being developed in a pro-active, contingent way. Consequently, it is not surprising that an improvised transition between the Methodology-as-Documented and the Methodology-in-Action was not observed in any of the three case projects.

8.5.2.8 Transition 8 – Methodology-in-Action to Methodology-in-Action (Contingent)

The dynamic nature of the environment in which large, complex IS development projects are executed frequently results in them being under significant time pressure. Whilst observations from the three case projects in this study have shown that iteration of ISDM tailoring is common, the time pressures to which projects of this type are subject typically results in development work continuing whilst tailoring efforts occur in parallel with development, and the episodes of tailoring in which new instances of the Methodology-in-Action are created from previous instances of the Methodology-in-Action tend not to be conducted pro-actively or in a contingent way.

It is important to again emphasise that these explanations offered for why these transitions were not observed during the present study are entirely speculative, and should be the subject of additional research.

8.6 Research Limitations

8.6.1 Limitations of the Research Design

The research reported in this thesis has a number of general limitations in its design.

Firstly, Sysco's ISDM consists of an overarching framework containing a large number of Delivery Processes which share close relationships within a common area of customer need. Each Delivery Process describes how to deliver a project in terms of a work breakdown structure (see Section 3.6.2.1). Within that family of Delivery Processes, the same Delivery Process (known as "Packaged Software") was used in the cases reported in Chapters 5 and 6. The case reported in Chapter 7 examined how the "Custom Application Development" Delivery Process was tailored.

Whilst the focus of the two Delivery Processes is different, they nonetheless have many similarities in that they are "structured" or "heavyweight" ISDMs. It therefore remains an open question whether the Model of Methodology Tailoring would adequately describe ISDM tailoring had an ISDM with a different structure (for example, an "agile" ISDM) been used.

Secondly, the three cases reported in this thesis examined ISDM tailoring as performed within one delivery organisation, "Sysco". It is unclear from this study whether a different organisation would adopt the same approach to tailoring when applying the same ISDM.

A potential limitation on the research was the employment relationship which was established between the researcher and Sysco as the research progressed. However, the overall design of the research, and the execution of the Pilot Study both occurred before the establishment of an employment relationship between the researcher and Sysco occurred.

The employment relationship which ensued provided both benefits to and limitations on the research. The employment relationship facilitated the research in that it provided firsthand experience of the culture and mindset within Sysco as it relates to the application of ISDMs. In addition, it offered a wider range of projects from which to select as cases as well as providing opportunities to access complex ISD projects.

Whilst employment at Sysco offered some benefits to the program of research, it also came with some constraints. A significant potential constraint was the risk that the researcher may be blind to aspects of the application of ISDMs other than in Sysco. To a large extent, this risk was mitigated by having undertaken the design of the study whilst an outsider. Subsequent to joining Sysco, the researcher worked hard to retain objectivity and retained a critical view. Being employed at Sysco also provided a deeper understanding of the terminology and jargon used within the organisation with respect to tailoring, whilst carrying with it the potential to get "caught up" in the jargon of Sysco.

Finally, all three of the case projects examined was undertaken by Sysco on behalf of the same client organisation. It therefore remains an open question whether the requirements of the client organisation may manifest themselves in changes to the way in which Sysco undertakes tailoring.

8.6.2 Case Study Limitations

This program of research used case studies as the means by which to develop an understanding of ISDM tailoring. A case based approach was chosen as this allows for a more detailed, "reality" based investigation (Galliers 1991). In addition, this facilitates the observation of the phenomenon of ISDM tailoring within the setting of a commercial delivery organisation (Silverman 1998, p.3), allowing for the building of theory from practice (Benbasat, Goldstein et al. 1987, p.370).

However, case based research has some significant limitations (Section 3.4), including:

- An inability to control variables;
- Likelihood that different interpretations of the same events may be made by different observers (Galliers 1991); and
- Whilst relationships between variables may be identified, the precise nature of the causal relationships cannot always be established (Cavaye 1996).

8.7 Future Research Directions

This study has provided insights into the tailoring of an ISDM on large, complex, commercial projects. Many opportunities remain for further research to extend this study.

Section 8.5.2 identified the set of transitions which were proposed in CF_1, for which no observational evidence had been collected during the three case projects. Further targeted research to seek exemplars of the transitions listed in Table 19 could be undertaken.

This study examined tailoring of the ISDM within the context of a single delivery organisation (Sysco), on projects for a single client (OzTel). However, it is possible that different outcomes may have been observed had a different delivery organisation been the focus of the study, as a different delivery organisation may possess a different ISDM and/or apply it in a different manner, or had different types of projects been examined, or had different client organisations been examined, as specific needs of that organisation may affect the manner in which the ISDM is tailored.

A further significant limitation of the research, identified in Section 8.6, is that each of the three case projects relied on the same set of qualitative data collection and analysis techniques. In Section 8.6 both general and case study specific research method limitations were discussed. This represents an opportunity for future research in that alternative data collection and analysis methods might be employed, or ISDM tailoring might be examined in a wide range of companies in order to ascertain whether the presently unobserved transitions are revealed.

During the description of the objectives of the third case project (Section 7.2.1.2), the structure of the case project was introduced. This structure, consisting of a number of releases, managed at the program level, each of which incorporated significant components in one or more functional domains was complex, and may itself have influenced the tailoring of the ISDM. However, as has been commented previously, the focus of the study was on the process of ISDM tailoring itself, rather than identifying the various characteristics which might influence it. This represents a further significant opportunity for further research.

8.8 Closing Observations

In conclusion, the investigation of the tailoring of an ISDM as executed in the three large, commercial projects reported in this thesis has yielded a validated model of ISDM tailoring, referred to as the Model of Methodology Tailoring. Observations made during the course of the study of the practice of ISDM tailoring in three complex, commercial projects has supported the contention made in Section 4.3.1 that an ISDM may exist in three states, rather than the two identified in earlier research.

Further, the observations made during the study provided evidence to support the existence of ten of the 18 transitions proposed in CF_1 presented in Section 4.3.1.

Finally, addressing the two research questions in this program of research has opened a challenging area of research for others to pursue at future times. This research should explore the use of the Model of Methodology Tailoring in explaining ISDM tailoring in other delivery and client organisations, in different types of projects, using different types of ISDMs, and using diverse data collection and analysis methods.

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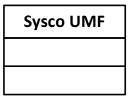
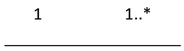
10 APPENDICES

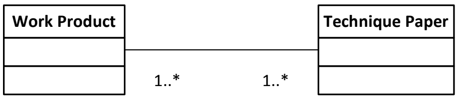
Appendix A UML Legend



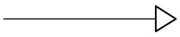
Identifies a type of artefact



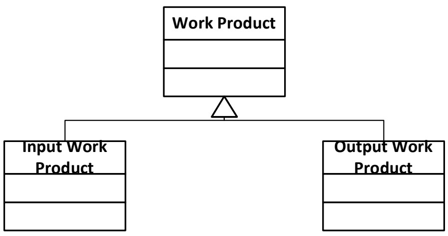
Identifies an association between two or more types of artefact in which the artefact at one end of the line has some type of association with that at the other end. These associations can be named.



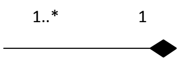
In this example, ONE to MANY work products have associated with them ONE to MANY technique papers. A technique paper is NOT a special type of work product (or vice versa), nor is a work product composed of a technique paper (or vice versa).



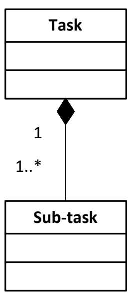
Identifies a relationship between two or more types of artefact in which the artefact at the head of the arrow is a more general form whilst that at the other end is a more specific form



In this example, Input Work Products and Output work Products are SPECIFIC sub-types of the more GENERAL Work Product type



Identifies a relationship between two or more types of artefact in which the object at the head of the diamond is composed of those at the other end.



In this example, ONE task is composed of at least ONE up to MANY sub-tasks

Appendix B MAW Observation Log Template

SYSCO CAD MODEL- MAW OBSERVATION LOG

SUMMARY

<table>
<tr><td>Date</td><td colspan="2"></td><td colspan="2">Task/Project</td><td colspan="4"></td></tr>
<tr><td colspan="9">Phase in which MAW Applied</td></tr>
<tr><td colspan="9">Solution Startup</td></tr>
<tr><td colspan="9">Environment</td></tr>
<tr><td colspan="9">Customer Premises</td></tr>
<tr><td>Type of Premises</td><td colspan="2">Meeting Room</td><td colspan="4">If premises were "Other", explain:</td><td colspan="2"></td></tr>
<tr><td>Support Materials Used</td><td colspan="2">PCs ☐</td><td colspan="2">Knowledge Base Access ☐</td><td colspan="2">Whiteboard ☐</td><td colspan="2">Other</td></tr>
<tr><td colspan="9">MAW Observations</td></tr>
<tr><td colspan="4">Were the stages/phases of project defined in MAW?</td><td colspan="5">Yes</td></tr>
<tr><td colspan="4">Were tasks to be performed during the project identified
(Identify FORM tasks take also)</td><td colspan="5">Yes</td></tr>
<tr><td colspan="4">List key tasks to be performed during project as identified during MAW</td><td colspan="5"></td></tr>
<tr><td colspan="4">Inputs to MAW Tasks identified?</td><td colspan="5">Yes</td></tr>
<tr><td colspan="2">Identified Inputs</td><td colspan="7"></td></tr>
<tr><td colspan="4">Outputs from MAW Tasks identified?</td><td colspan="5">Yes</td></tr>
<tr><td colspan="2">Identified Outputs</td><td colspan="7"></td></tr>
<tr><td colspan="4">Constraints Identified?</td><td colspan="5">Yes</td></tr>
<tr><td>Were the constraints:</td><td>Time ☐</td><td>Budget ($) ☐</td><td>People ☐</td><td colspan="2">Regulatory requiremts ☐</td><td colspan="2">Technology stds. ☐</td><td>Other</td></tr>
<tr><td>Were Key Roles Identified?</td><td colspan="8">Yes</td></tr>
<tr><td>List Key Roles Identified</td><td colspan="8"></td></tr>
<tr><td>Support Tools Used in MAW (List)</td><td colspan="8"></td></tr>
<tr><td>Support Tools Identified for Project
(List)</td><td colspan="8"></td></tr>
</table>

Techniques Used in MAW (List)	Data-centred		Process-centred
Influences on Methodology Modification			
External Factors			
Legislation	Yes	Note	
Standards	Yes	Note	
Customer/Stakeholder Pressure	Yes	Note	
Other	Yes	Note	
Development Organisation Related Factors			
Organisation size	Yes	Note	
Familiarity with technology	Yes	Note	
Organisational culture with respect to methodology application	Yes	Note	
Client Organisation Related Factors			
Client organisation standards	Yes	Note	
Project Factors			
Type of problem	Yes	Note	
Custom/packaged solution	Yes	Note	
Problem domain	Yes	Note	
People Factors			
Personal experience	Yes	Note	
Academic qualifications	Yes		
Industry certifications	Yes	Note	
Personal qualities	Yes	Note	
Personal perception of usefulness of methodology	Yes	Note	
Personal perception of ease of use of methodology	Yes	Note	
Perceived Risk	Yes	Note	
Decision Points			
Were other options considered? [OPTION]	Yes		
If so, what were they?			
What criteria were applied in selecting the chosen option? [CRITERIA]			
What weightings (if any) were applied to the criteria to select the appropriate option?			

TAILORING EVENT LOG

Item #	Timestamp	Participant(s)	Event Description	Comments
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Appendix C Sample Method Exponent Interview Guide

Interview guide

This guide briefly describes the suggested interview process and questions for the interviews of Sysco Method exponents in which the way in which they apply the Method in practice is examined.

Pre-interview

Initial contact – telephone

Follow-up letter/email confirming date/time/location, and including some background to research and interview

Day before interview

Logistics

- Digital voice recorder, microphone & spare batteries
- Copies of consent form and Plain Language Statement

Interview Introduction – 5 minutes

Welcome

Introduce myself; thank them for agreeing to this interview.

Purpose of interview

Research background

The purpose of this research is to increase understanding of the ways in which methodologies for the creation of system architectures are applied in practice. Previous studies have shown that the use of ISD methodologies, whilst not always precisely reflecting the way practitioners work, is indeed an appropriate way with which to create information systems. However, a significant body of research has also shown that rather than following the documented form of the methodology, practitioners create a unique instantiation of that methodology – the "methodology-in-action" (Fitzgerald 1997) for each project.

The focus of the study of which this interview is part, is to determine why (and how) methodologies for the creation of software architectures are not used as documented and what is the nature of the modification?

Why is this worth doing?

It is commonly accepted that the use of a methodology for the development of software systems is appropriate, however, a review of the literature results in a clear view being formed that methodologies are not used as published, but instead, are frequently modified (Barrow, Frampton et al. 2005; Fitzgerald 1994a; 1997; 1998a; Hardy, Thompson et al. 1995; Iivari 2000; Iivari, Hirschheim et al. 1998; Visser 1992; Wynekoop and Russo 1997).

The studies which have previously examined methodology use differ from this study in the following ways:

- They have not examined a methodology for the creation of a system or software architecture.
- They have tended to be post-hoc studies, where participants have been asked to reflect on what they have already done. Studies of this sort tend to capture the developers rationalisation of what they did or what they should have done, rather than what they actually did.
- They have used students instead of experienced practitioners, and/or they have observed methodology modification as applied to contrived problems.

This study seeks to address these limitations by observing experienced practitioners applying a commercial systems architecture development methodology to one or more live customer projects.

The benefit to the organisation which owns the methodology is that identification of the influences affecting methodology tailoring can be fed back in to the methodology itself. This capturing and codification of practice will mean that the documented form of the methodology will more closely resemble practice.

For educational institutions, such as the this university, a better understanding of the way in which methodologies are actually applied, and the influences which experienced practitioners identify as points of departure from the documented form of the methodology, will enable improved teaching of IT architects and a clearer focus on the capabilities to be fostered within students and will inform course content and curriculum development.

In addition, the research area of IT architecture methodology is very sparsely covered. This research will provide insight into this area and be a basis for further IT architecture methodology related research.

This interview

In this interview I plan to ask you for:

1. Some background information on your role, responsibilities, and experience,
2. How you go about applying the Sysco ISDM in practice, and
3. What you use as cues to depart from the documented form of the Sysco ISDM.

I am recording the interview for later transcription & analysis with your consent.

Context & planned usage of interview information

- Confidentiality & privacy
  Other than your name, your current role & responsibilities, and a summary of your experience, no personal information is being collected in this research. This information will be stored in a secure manner, made anonymous for purposes of analysis & collation, and will not be disclosed or reported on in any manner that enables identification of the interviews.
- Consent form

Could you please read, and if it is acceptable, sign the consent form for this interview.

- Recording

Thank you, here is the voice recorder.[3]

[3] The voice recorder will only be turned on at this point. Also remember to keep the voice recorder away from any paper and other noises.

Background – 20 minutes

Personal

Suggested Questions

1. Age?
2. Gender?
3. What academic qualifications do you possess? Please list ***all*** of them.
4. Do you hold formal certifications (e.g. IT architect, Qualified Method Exponent) in the Sysco ISDM, and if so, which do you possess?
5. Do you hold formal industry certifications other than those in the Sysco ISDM, and if so, which do you possess?

Experience

Suggested questions

1. How long have you been in the IT industry?
2. Could you please provide a summary of your career so far? Please provide an overview of the industry sectors in which you have worked, and the size (in $ or some other metric) of the projects on which you have worked.
3. What is your background/experience with Information Systems Development Methodologies other than the Sysco ISDM? Please define it in terms of number of years. What is your background/experience with each of the Information Systems Development Methodologies which you have exposure to? Are you certified in these ISDMs?
4. How long have you worked for Sysco?
5. What is your background/experience with the Sysco ISDM? Please define it in terms of number of years. How would you describe the focus of the Sysco ISDM?
    a. Does it focus just on the "system" under development [where system includes the people and other organisational factors], or just on the technical issues. If necessary, make a distinction between the various models contained within the Sysco ISDM.
    b. How would you describe the type of life cycle used by the Sysco ISDM? [If necessary, make a distinction between the various models contained within the Sysco ISDM.]
    c. In your view, what ***is*** and ***isn't*** the Sysco ISDM? For example, it isn't a rigid, prescriptive way of working.
6. Do you have what you consider to be a successful "formula" in the way in which you apply the Sysco ISDM? If so, could you outline the essential elements of it?

Role & responsibilities

Suggested Questions

1. Could you please briefly explain what your current role is?
2. Within that role, what are you responsible for?
3. Why do you do this role?
   a. Upsides?
   b. Down-sides?

Question area: How closely to the documented form of the Sysco ISDM do you adhere on a project? – 15 minutes

Sub-question: One of the key tasks in the Solution Startup phase of the Sysco ISDM is to tailor the method. On the projects on which you have worked and applied the CAD model, what percentage of them would have held a formal Method Adoption Workshop (MAW)?

Sub-question: If a formal MAW was not held, what was/were the typical reasons for this?

Sub-question: Of the projects where a formal MAW was not held, in what percentage of them would an informal meeting at which tailoring of the Sysco ISDM to suit the project was discussed have been held?

Sub-question: Where neither a MAW nor an informal tailoring meeting took place, was the Sysco ISDM tailored to suit the characteristics of the specific project?

Sub-question: If so, how was this tailoring undertaken?

Any examples?

Question area: What is the nature of the departure from the way in which the documented form of the Sysco ISDM describes ISDM tailoring? – 20 minutes

Sub-question: Which areas of the Sysco ISDM are modified:

- Input/output Work Products
- Techniques
- Tools
- Roles
- Deliverables
- Sequence in which tasks/phases etc. are performed
- Other

and for each of these, what form does the modification take? Is it addition, deletion, modification or some other?

Sub-question: What is the nature of the influences which drive the departure from the documented form of the method?

1. Personal experience
2. Aspects of the environment external to the project, such as:
    - Legislation
    - Formal standards
    - Adherence to trends such as CMMI, J2EE, .NET etc
    - Other
3. Attributes of the development organisation such as:
    - size of the organisation
    - familiarity with the technology being proposed/employed
    - organisational culture with respect to methodology application
4. Client organisation standards
5. Project attributes such as:
    - Type of problem
    - Type of contract (e.g. fixed price)
    - Constraints (time, money, personnel) – in particular, fixed-price projects
    - Type of solution selected (custom, off-the-shelf)
    - Project phase/time
    - Maturity of selected technology
    - Other
6. People/role attributes such as:
    - Experience of people involved
    - Capabilities
    - Education (academic qualifications and industry certifications)
    - Gender
    - Other personal qualities
7. Methodology related influences such as:
    - Mis-match between model used by method and problem
    - Inadequate or inappropriate tools and techniques
    - Scope of method is too broad/too narrow (e.g. focuses only on developing an IT solution)
    - Completeness of methodology
    - Philosophical mis-match (wrong paradigm, objective, domain, target)
    - Other

8. Others?

Any examples?

Question area: How would you categorise the ability of the Sysco ISDM as documented to identify potential factors for method modification? – 10 minutes

Sub-question: Would you describe the ability of the Sysco ISDM's documented form to identify potential factors for method modification as poor, satisfactory, or very good? Please explain your answer.

Sub-question: Consider the situation where you, or a colleague, has identified the need for a new work product, technique, role etc. How would you describe the process which needs to be followed to incorporate this into the documented form of the Sysco ISDM?

Sub-question: Where you have followed the process described above for the incorporation of a new work product, technique, role etc., what was the result?

Closing – 5 minutes

Anything else you would like to say?

What are your outside interests? Hobbies?

After this turn off voice recorder.

Who else would you suggest I interview?

- How could I contact them?
- Can I use your name?

What happens next?

The interviewed will be transcribed; I will send you a copy of the transcription so you can confirm that it is OK. The identifying information will be removed from the transcription and the transcription will be analysed for methodology tailoring influences and combined with the results of similar analyses from other interview transcriptions. This will then be the basis for a candidate set of methodology tailoring influences that will be further researched with observation of architects applying the Sysco ISDM to live projects.

More information?

Ethics related

Any complaints about your participation in this project may be directed to the Senior Ethics Officer, Ethics Administration, this university on (02) 3456 7890 (Telephone); (02) 3456 7891 (Facsimile) or someemail@thisuniversity.edu.au. Details of the complaints procedure are available from the above address.

Project related

For anything relating to this research in general, please contact me, Rob Barrow, on 0412 345 678, and/or rbar4967@thisuniversity.edu.au

Thank you!

Post interview

Immediately after interview

Logistics

- Transfer recording to PC and back up

Day after interview

- Complete Contact Sheet
- Update List of Interviewees
- Thank you letter/email with copy of signed consent form
- Organise transcription
- Load recordings onto PC
- Review notes and make any immediate additions & comments

After transcription

- Send copy to interviewee, if wanted

Appendix D Sample Coding Sheet

Area	Code	Definition of Code	Notes
Architect Background			
Age	AGE	Architect's age at the time of interview	
Gender	GEND	Architect's gender	
Country of birth	BIRT	Architect's country of birth	
Country in which academic qualification obtained	COUN	Country in which academic qualification obtained	
Academic qualifications	ACAD	Academic qualification held by architect	
Roles occupied	ROLE	Role occupied by architect in course of their employment	
Industry sector	SECT	Industry sector in which architect employed	
Organisation employed by	EMPL	Organisation architect employed by	
Years of experience	YEAR	Years of experience of architect in a particular role	
Industry certifications	INDU	Industry certification held by architect	
Methodology Background			
Philosophy of the methodology	PHIL	Underlying philosophy of the methodology: using the Avison and Fitzgerald definition here	Elements include: paradigm, objectives, domain, and target. Might need separate elements instead?
Purpose of the methodology	PURP	What was the underlying motivation for the creation of the methodology	For example, consolidation of intellectual capital, re-use of existing assets etc.
Type of methodology	TYPE	Type of methodology under discussion	Examples are engagement methodology, design methodology
Focus of methodology	FOCS	Aspect of the system under development which is the focus of the methodology	Is the focus of the methodology on the *people*, or on the *technical*?

Methodology components	COMP	Component of the methodology – this may be work product, deliverable, role, technique, capability pattern, execution model, reference architecture etc	
Methodology outputs	OUTP	Statement of what application of the methodology actually produces	What does it produce?
Methodology change process	CHAN	Process for modifying the documented form of the methodology.	Is the process for methodology change formal or informal? NOT referring to MAWs – referring here to process by which the documented form is changed
Methodology structure	STRUC	Discussion relating to the structure of the methodology	For example, is it a framework?
Methodology tailoring process	TAIL	Process for tailoring the methodology to suit characteristics of a project	Is the process for methodology tailoring formal or informal – refers here to the MAW
Scope of methodology	SCOP	What is the breadth of scope of the methodology?	Does it include project management aspects, include change management, or does it focus exclusively on the system development aspects?
Methodology Application			
Type of project	PROJ	The type of project	Examples are consultancy and deliverable(?). different to the scope of the methodology, which can be engagement or design.
Frequency of departure from methodology	FREQ	Discussion of how often departure from methodology takes place	May need to split this into: - departure from methodology in their total experience - departure from methodology on individual projects
Method of application of methodology	APPL	How does the methodology get applied?	Top-down, bottom-up, sandwich
Nature of departure from methodology	NATU	The form which the departure from the documented form of the methodology takes	e.g. addition, deletion, modification, creation of work products, roles, techniques, patterns, models

	ADD	Addition of an existing methodology artefact to the instantiated form of the methodology	
	DELT	Deletion of an existing methodology artefact to the instantiated form of the methodology	
	CREA	Creation and addition of a new artefact to the instantiated form of the methodology	
	EDIT	Modification of an existing methodology artefact in the instantiated form of the methodology	
Motivation for departure from methodology	MOTV	High level motivation for departure from the documented form of the methodology	NOT same as stimulus – e.g. align with project needs or strategic business goals
Architect activity	ACTV	Activity performed by architect as part of their duties	e.g. understand requirements, solution development, solution verification
Departure from “official” or documented methodology	GAP	Respondent identifies the gap between the documented form of a methodology, and the instantiated form	
Stimulus for departure from methodology	STIM	What does the architect recognise as the stimulus for the departure from the documented form of the methodology?	e.g. experience of practitioner, community of practice, conversation
Experience	EXPR	Application of architect experience to tailor the Method	
Project attributes	PRJC	Attributes of the project used as stimulus for tailoring of method	
Industry Standard	STAN	Industry standard used as stimulus for tailoring of method	
Organisational Standard	ORGS	Organisational standard used as stimulus for tailoring of method	
Personnel	PERS	Personnel used as stimulus for tailoring of method	e.g. Method called for a technique which personnel were not trained or equipped to execute
Technology	TECH	Technology being used or proposed used as	

		stimulus for tailoring of method	
Nature of Method Adoption Workshop	MAW-N	Was the MAW formal or informal?	
Frequency of conducting MAW	MAW-F		
Purpose of MAW	MAW-P	What was the reason for conducting the MAW?	Training, ISDM tailoring, price estimation, proof of concept etc..
Time of engagement	TIME	When was the IT architect engaged on the project?	
Administration			
Validation	VALD	Validation of information supplied by interviewee	

Appendix E Contact Sheet Template

BACKGROUND INFORMATION SHEET

Date	Site	Contact Code

Role:
Your Name:
Title or position: Business Analyst
What does your position involve?

Period worked as an IT architect: 1 years
Previous work experience:
Inside Sysco:

In other organisations:

Formal training and education:
general -

specifically for working as an architect -

Current Project
Briefly describe the system:

How is the project managed?

Is a methodology being used to manage the project? If so, what is it?

Is a methodology being used to manage the development process? If so, what is it?

What is the estimated size of the project? (Development time, man-months, budget)

How did you learn to do architecting?

What are the main skills needed?
Technical

Personal

What do you find are the main problems in doing architecting?
Eg technical, people or management issues?

In what areas would you appreciate support or help, through tools or techniques?

Summary of this contact

What were the main issues or themes that struck you in this contact?

Summarise the information you got (or failed to get) on each theme you were observing for this contact.

Anything that struck you as salient, interesting, illuminating or important in this contact?

What new (or existing) themes or questions need to be considered in the next contact?

Appendix F MAW Observation Data Sample

[redacted] CA METHOD APPLICATION DATA CAPTURE

IMPORTANT EVENT?	☐		
Date	10/9/04	Page Number	1
Group Members	[redacted] (KH)	[redacted] (PH)	[redacted] (OA)
Case Study	Case Study 1 - High Level Architecture for a Student Email System		
Time of Event			
Initials of Participants/Overall Record the initials of the participants involved in the interaction or indicate whether whole group involved			
Comments Addressed To Record the initials of the participant(s) to whom the comments were addressed or indicate whether the whole group was involved	Group		
Reference to artefact/photograph Where some artefact is produced, such as a work product or deliverable, or a photograph is taken, record a reference to it here.			
Part of phase under study or part of a different phase? Attempt to identify the phase which the technique being used comes from			
Technique being used Circle one	Use of assumptions Questioning of stakeholder	Questioning assumptions Use of scenarios	Reference to prior patterns Brainstorming Reference to prior experience Panic
Any other definable technique			

Additional Notes
For example – was this additional to the method, used instead of an element of the method?

KH/PH/OA spent time (~ 20 mins) reading case study. For first mins, no questions were asked.

"SEP" – don't have to worry about implementing it".

[redacted] CA METHOD APPLICATION DATA CAPTURE

IMPORTANT EVENT?	☐		
Date	10/9/04	Page Number	2
Group Members	[redacted](KH)	[redacted](PH)	[redacted](OA)
Case Study	Case Study 1 - High Level Architecture for a Student Email System		
Time of Event	1112		
Initials of Participants/Overall Record the initials of the participants involved in the interaction or indicate whether whole group involved	ALL		
Comments Addressed To Record the initials of the participant(s) to whom the comments were addressed or indicate whether the whole group was involved	Group		
Reference to artefact/photograph Where some artefact is produced, such as a work product or deliverable, or a photograph is taken, record a reference to it here.			
Part of phase under study or part of a different phase? Attempt to identify the phase which the technique being used comes from			
Technique being used Circle one	Use of assumptions Questioning of stakeholder	Questioning assumptions Use of scenarios	Reference to prior patterns Brainstorming Reference to prior experience Panic
Any other definable technique			

Additional Notes
For example – was this additional to the method, used instead of an element of the method?

[redacted]CA METHOD APPLICATION DATA CAPTURE

IMPORTANT EVENT?	☐		
Date	1$\not{0}$/9/$\not{0}$4	Page Number	4
Group Members	[redacted](KH)	[redacted](PH)	[redacted](OA)
Case Study	Case Study 1 - High Level Architecture for a Student Email System		
Time of Event	1115		
Initials of Participants/Overall Record the initials of the participants involved in the interaction or indicate whether whole group involved	All.		
Comments Addressed To Record the initials of the participant(s) to whom the comments were addressed or indicate whether the whole group was involved	Group		
Reference to artefact/photograph Where some artefact is produced, such as a work product or deliverable, or a photograph is taken, record a reference to it here.			
Part of phase under study or part of a different phase? Attempt to identify the phase which the technique being used comes from			
Technique being used Circle one	Use of assumptions / Questioning of stakeholder	Questioning assumptions / Use of scenarios	Reference to prior patterns / Brainstorming / Reference to prior experience / Panic
Any other definable technique			

Additional Notes
For example – was this additional to the method, used instead of an element of the method?

Use a reference architecture for email?

[redacted] CA METHOD APPLICATION DATA CAPTURE

IMPORTANT EVENT?	☐		
Date	19/9/04.	Page Number	6.
Group Members	[redacted] (KH)	[redacted] (PH)	[redacted] (OA)
Case Study	Case Stucy 1 - High Level Architecture for a Student Email System		
Time of Event	1117		
Initials of Participants/Overall Record the initials of the participants involved in the interaction or indicate whether whole group involved	all		
Comments Addressed To Record the initials of the participant(s) to whom the comments were addressed or indicate whether the whole group was involved	Group		
Reference to artefact/photograph Where some artefact is produced, such as a work product or deliverable, or a photograph is taken, record a reference to it here.			
Part of phase under study or part of a different phase? Attempt to identify the phase which the technique being used comes from			
Technique being used Circle one	Use of assumptions Questioning of stakeholder	Questioning assumptions Use of scenarios	Reference to prior patterns Brainstorming Reference to prior experience Panic
Any other definable technique			

Additional Notes
For example – was this additional to the method, used instead of an element of the method?

Use a package → Exchange

→ Notes → better (replication?)

→ no mail client

web interface only.

lot Study Documents Collected

	Purpose
	Provides a standard set of questions to put to Pilot Study Workshop participants
	Provides a structured approach to ensure all key areas requiring investigation during the Pilot Study MAWs are covered

w Sheets	Captures responses from <u>each</u> participant in the Pilot Workshop MAWs to questions covering:
	• Biographical information
	• Experience in IT and ISDM use
	• Reflections on the MAW, including:
	  o Level of tailoring
	  o Areas of the ISDM tailored
	  o Stimuli for tailoring decisions
	  o Nature of tailoring
	• For the tailoring process
	  o What options were considered?
	  o Which option was chosen?
	  o What was the motivation for selecting this option?

	Diagrams	drawings and pen and paper sketches made by participants in the course of the workshops
	Sysco Pilot MAW Workshop 1 Group 2 Diagrams	
	Sysco Pilot MAW Workshop 2 Group 1 Diagrams	
	Sysco Pilot MAW Workshop 2 Group 2 Diagrams	

Note:
Due to commercial confidentiality constraints, neither the Case Study document, nor the diagrams can be included in the thesis. Both draw on Sysco intellectual property.

Appendix H Record of Subjects

	Code Used in Thesis	Organisation	Biographical Information
Pilot Study			
Pilot Study Workshops			
Workshop 1	OITA-5	Sysco	Male 38 years IT experience Works primarily as a Method Exponent
	OITA-6		Male 20 years IT experience Works primarily as an IT Architect with focus on telecommunications sector
	OITA-8		Male 19 years IT experience Works primarily as an IT Architect with focus on Enterprise Architecture
Workshop 2	PITA-1		Male 22 years IT experience Works primarily as an IT Architect, currently focusing on mining sector
	OITA-9		Male 28 years IT experience Works primarily as an IT Architect with a focus on defining and executing technical governance processes
	OITA-10		Male 32 years IT experience Works primarily as an IT Architect, leading the design and implementation of large, complex solutions
Pilot Study Method Exponent Interviewees			
	PITA-1 (3 interviews)	Sysco	Male 22 years IT experience Works primarily as an IT Architect, currently focusing on mining sector
	PITA-2		Male 14 years IT experience Works primarily as an IT Architect, currently focusing on banking and financial services sector
	PITA-4		Male 8 years IT experience Works primarily as an IT Architect, currently focusing on telecommunications sector
	PITA-3		Female 11 years IT experience Works primarily as an IT Architect, currently focusing on telecommunications sector

	ME-2 (2 interviews)		Male 19 years IT experience Works primarily as a Method Exponent and as a Systems Engineer, defining and implementing technical governance
	ME-7		Male 21 years IT experience Works as the "owner" of the Sysco ISDM in Australia and New Zealand
	ME-1		Male 38 years IT experience Works as an IT Architect and Method Exponent
Case 1			
MAW Observation Participants			
Single Participant MAWs	ME-6 (5 instances observed)	Sysco	Male 11 years IT experience Works as a Method Exponent and Systems Engineer
Multiple Participant MAWs	RITA-1 (17 instances observed)	Sysco	Male 16 years IT experience Works as Release IT Architect on Sysco Supply Chain Program SC1 release
	RPM-1 (5 instances observed)		Male 24 years IT experience Works as (contracted) Release Manager responsible for delivery of Sysco Supply Chain Program SC1 release
	ME-6 (17 instances observed)		Male 11 years IT experience Works as a Method Exponent and Systems Engineer
	CITA-1 (11 instances observed)		Male 14 years IT experience Works as lead IT Architect on Sysco Supply Chain Program
	OITA-10 (3 instances observed)		Male 32 years IT experience Works primarily as an IT Architect, leading the design and implementation of large, complex solutions

MAW Participant Interviews			
	CITA-1	Sysco	Male 14 years IT experience Works as lead IT Architect on Sysco Supply Chain Program
	RITA-1		Male 16 years IT experience Works as Release IT Architect on Sysco Supply Chain Program SC1 release
	RITA-2		Male 15 years IT experience Works as Release IT Architect on Sysco Supply Chain Program SC4 release
	PPM-1		Male 14 years IT experience Works as (contracted) Program Manager responsible for delivery of Sysco Supply Chain Program SC1 release
	RPM-1		Male 24 years IT experience Works as (contracted) Release Manager responsible for delivery of Sysco Supply Chain Program SC1 release
	TL-1		Male 22 years IT experience Works as Sysco Test Lead, responsible for planning and executing the approach to testing across the Sysco Supply Chain Program

Case 2			
MAW Observation Participants			
Single Participant MAWs	ME-6 (5 instances observed)	Sysco	Male 11 years IT experience Works as a Method Exponent and Systems Engineer
Multiple Participant MAWs	ME-6 (3 instances observed)	Sysco	Male 11 years IT experience Works as a Method Exponent and Systems Engineer
	RPM-2 (2 instances observed)		Male 19 years IT experience Works as Release Manager for SC3/SC3.1 release with responsibility for delivery
	RITA-2 (1 instance observed)		Male 15 years IT experience Works as Release IT Architect on Sysco Supply Chain Program SC4 release
MAW Participant Interviews			
	ME-6 (3 interviews)	Sysco	Male 11 years IT experience Works as a Method Exponent and Systems Engineer
	RPM-2 (1 interview)		Male 19 years IT experience Works as Release Manager for SC3/SC3.1 release with responsibility for delivery
	RITA-2 (2 interviews)		Male 15 years IT experience Works as Release IT Architect on Sysco Supply Chain Program SC4 release
Release Manager Interviews			
	RPM-2 (4 interviews)	Sysco	Male 19 years IT experience Works as Release Manager for SC3/SC3.1 release with responsibility for delivery

Case 3			
MAW Observation Participants			
Informal, multiple participant MAWs	ME-1 (3 instances observed)	Sysco	Male 38 years IT experience Works as an IT Architect and Method Exponent Role on the project was to work as part of a team, on tailoring the Sysco ISDM so as to define a structure and content enabling delivery of a solution
	ME-4 (3 instances observed)		Male 29 years IT experience Works as an IT Architect and Method Exponent Role on the project was to work as part of a team, on tailoring the Sysco ISDM so as to define a structure and content enabling delivery of a solution
	ME-8 (1 instance observed)		Male 26 years IT experience Works as an IT Architect and Method Exponent Role on the project was to work as part of a team, on tailoring the Sysco ISDM so as to define a structure and content enabling delivery of a solution Usually (but not exclusively) located remotely from the other two Method Exponents
Formal, multiple participant MAW	ME-1 (1 instance observed)	Sysco	Male 38 years IT experience Works as an IT Architect and Method Exponent Role on the project was to work as part of a team, on tailoring the Sysco ISDM so as to define a structure and content enabling delivery of a solution
	RITA-4 (1 instance observed)		Male Unspecified years of IT experience Works as an IT Architect with responsibility for the design and development of the Customer Service Assurance functionality within the TeleTransform TR.1 release
MAW Participant Interviews			
Formal, multiple participant MAW	ME-1 (1 interview)	Sysco	Male 38 years IT experience Works as an IT Architect and Method Exponent Role on the project was to work as part of a team, on tailoring the Sysco ISDM so as to define a structure and content enabling delivery of a solution
	ME-4 (1 interview)		Male 29 years IT experience Works as an IT Architect and Method Exponent Role on the project was to work as part of a team, on tailoring the Sysco ISDM so as to define a structure and content enabling delivery of a solution

	RITA-4 (1 interview)		Male Unspecified years of IT experience Works as an IT Architect with responsibility for the design and development of the Customer Service Assurance functionality within the TeleTransform TR.1 release

Appendix I Sample Interview Transcript

Note – identity of interview subjects has been masked, as has the organisation which employs them

ANALYSIS ②

*INTERVIEW WITH [redacted] AND [redacted]
*CONDUCTED ON WEDNESDAY 15TH MARCH 2006
*AT NAB, 800 BOURKE STREET MELBOURNE

[redacted] 11:57
Thanks Rob. How far back do you want me to go?
*ROB BARROW 12:07
Go back as far as you like, to the beginning, the beginning of your IT industry career.
[redacted] 12:10
Ah yeah, okay. I guess my beginning of my IT industry involvement was at the end of my university years, um, um when I was, um, finishing graduating from um Russian Technological University, um and um, um I was interested in IT even though my major was not in IT and I retained this interest throughout you know following further studies in second degree in ah applied mathematics and then I undertook my studies as Ph.D. in computer science, um, ah, I guess the first ah ten years of my career were typical um career of lead developer/lead designer ah, um, um, from the IT perspective although from administrative perspective it was more like I was leading a, a, ah a lab in the ah, R&D organization
*ROB BARROW 13:16
Was that here in Australia?
*[redacted] 13:18
No, that was in Russia, it was overseas, um, um, so, you know even though my ah management position was leading a, leading a lab but um, I was involved very much hands-on in, in many aspects of the projects that we ah, were undertaking, in fact um you know I was leading most of these projects that were contributing to my part-time Ph.D. studies that I was doing with the um, um, ah, Institute of Technical Cybernetics in the Russian Academy of Science, um, where I got my Ph.D. from and um when I came to Australia um, I continued my IT career pretty much first years, couple of years as a developer and a lead of some small team of developers, um,
*ROB BARROW 14:20
Was that in a specific industry?
[redacted] 14:21
Um, it was actually, I was, I was working in um, Monash University um, I was part of their ah, AMIS department which was Administrative Management and Information Systems, so there was a group of people um, there who were concerned with ah developing of front ends and client server systems for, for, for Monash University and ah, you know I was involved in that work. Before I went back to my academic pursuits, and joined ah, our department at RMIT.
* ROB BARROW 14:55
So how long were you at Monash University?
[redacted] 14:57
Ah, for two years.
*ROB BARROW 14:59
Ah, how long ago. What years?
[redacted] 15:01
Ah that was between 92 and 90 ah, end of 94, so that was ah, slightly more than 2 years. That was from ah, yeah, June 92 to end of 94
*ROB BARROW 15:15
And the roles you occupied there were those of developer, lead developer, designer?
*[redacted] 15:19
Team lead, yes, yes, um, um so that, that was kind of a,a I guess bridging activity before um I sort of looked around and ah you know I found um, ah, an opportunity at RMIT and I decided to go back to my academic pursuits. So I started with RMIT as a full time lecturer ah, from 95 ah, til the end of 97 um, ah, so at that time you know I pretty much tried to, as part of my background I tried to retain my quest for, you know, doing two things simultaneously that I ah, have you know probably throughout all of my career, cause I've been interested in academic sides of things and research methods, um, and research within the IT industry, and in, in computer science with, ah, applying um, IT methods in, in practice in, in, in my daily work. So being full time lecturer at RMIT I was heavily involved in um, um, work um, that a lot of lecturers from the department were involved in which was um work with Technisearch which was commercial arm of RMIT at that time, um, whereby we were involved in both

commercial teaching as well as um, actually winning practical projects ah, with um, with ah different govern, govern, government departments.

*ROB BARROW 16:49

And your role when a contract was won was to do what?

[redacted] 16:58

Um, ah, I er, had a role of project manager, lead developer, ah, application architect which didn't exist at that time, but, you know now, looking back that was kind of ah, role that I would attribute it to at, at that time, um, because of the, I guess, goals that and the activities that this role entailed like you know you developed the concept, you understand the requirements, you come up with the solution, that would be commensurate with that, with those requirements and you would work with the clients to verify the solution and you would be actively with the client's representatives and working with the client project manager and things like that, so we would have, um, a number of projects, practical projects that I was involved in and, um, throughout this projects and most of them I was ah, doing role of you know, lead application architect as well as more specifically in one project I was project manager, on another project I was, a couple of projects actually, I was the lead, um, ah, data modeler as well, so.

*ROB BARROW 18:09

So that takes you up to the end of 97 where you finished with

*[redacted] 18:13

With RMIT, and I joined um, United Energy ah, as um, Senior ah, IT Architect in the ah mid-range ah group, within the mid-range group where I was responsible for a number of infra-structural projects um, I led the, ah, Y2K project ah, for the mid-range group um, ah, you know analyzing ah different aspects of the mid-range architecture in United Energy as well you know, you know running some

*ROB BARROW 18:44

You say "mid-range", "mid-range" in what sense?

*[redacted] 18:46

Ah, cause the um, many organizations um, they IT departments are split according to the platforms that they are looking after like a mainframe platform or a mid-range platform or ah, PC or desktop er, er, platforms and things like that so, that was um, one of the most ah, highly used and um stressed platforms which was mid-range the most interesting work was there. Um, er, so that ah, I spent ah, ah, one year ah at United Energy ah, before I joined um, um [redacted] um Global Services ah where I spent my time on a number of projects of various ahm, in various roles but um mainly I guess if we ah without going into detail of each and every project and the clients involved I would um like to summarize ah probably what what would be most interest to, to your project here um, was that um the group that I was involved with um, ah I guess had a luxury to offer us um, quite a variety of, of um of types of projects that we get involved into that would be ah, ah starting with a high very high level consultancy ah working for senior technologists um you know, for our clients, um doing a kind of I would, I would classify industrial research, um things that would ah, where you would use your expertise and your, your knowledge of technology, um,

*ROB BARROW 20:32

And your research and analysis skills?

*[redacted] 20:34

And your research and analysis capabilities to advise clients ah, about, you know, strategic application of that or this technology and, um, advising them about this technology potentially being fit for purpose for their, you know, and aligned with their strategic needs.

*ROB BARROW 20:52

Is this in, in a particular industry sector or is it across a variety of sectors?

*[redacted] 20:55

I would say that would be in telecommunications sector mostly um, which was, you know, highly um, um developed sector at that time so um, and um, so we, that would be um, one end of the spectrum er, er from another hand we were involved in um ah consulting clients with their, ah you know with their, projects that they had in mind in more traditional architectural sense, ok well here is the set of requirements, what is the best way to proceed to the solution that would be most effective for this set of requirements and ah, um, that would be closer to typical role of an architect, um on, you know, tactical and you know, not necessarily strategic solutions. Is, um, so that would be I guess, um, plus, we,

we from time to time we were involved in high level, very high level consultancies at the level of enterprise architecture but ah, um, ah, so, so that, that's what I'm trying to say that, that was luxury of being involved in a very wide range of different projects.
*ROB BARROW 22:14
Are you within BCS within [redacted]
[redacted] 22:15
No, no we are organizationally we, we are part of AMS, but I wouldn't say that this would influence in any way um
*ROB BARROW 22:19
I might just pick up with [redacted] here for a moment and there are some additional questions I have relating specifically to methodology usage, so if you could perhaps [redacted] summarize your career which I know has transcended a couple of continents, so specifically the thing I'm looking for just as an overview, um, highlights of your career in terms of types of roles, industry sectors, size of jobs, um, that sort of thing.
*[redacted] 23:00
Ah, well, I've been working in the industry since um, 1980, so I was doing my um, university degree which equates to a Bachelor's degree in Computer Science, and I did that over five years, so I was working and doing my university studies. And this was overseas in, in Argentina in South America, and, ah initially I started working as a developer ah, so my first job was for about a year, a year and a half in a service bureau, which was quite interesting because they had this very ancient, that you know, at that time, they were already ancient machines with ah, that, that only had card readers for example, and so I got to do some coding on those machines so it was quite interesting. Ah, and and then I moved, pretty quickly I moved on to another ah job at Diners Club ah, which is in the finance sector, ah, and I worked particularly in the credit area there, with ah, systems related to that, and, and then some banking because um, they were, um, bought by ah, Citi, Citibank at some point. Um, and pretty much a development role, I was, very much a specialist on you know, particular technologies so I got, at that point the, say first eight years of my career I was ah very much ah very technically focused, very much a specialist in, in certain, particularly in a transaction monitor ah, and I also started doing some architecture work, so, so I kind of like moved up the abstraction in terms of you know the software development life cycle ah, and I did one of my ah, I guess my most satisfactory projects at that time around mid 80s ah, which was a an authorization systems through ah points of sale in different, so we had, you know, points of sale in different establishments and a system that handled the authorization. So that was kind of a distributed system which was, wasn't like the norm at that point. They were more mainframe, dumb terminal type systems so, and I was you know, the technical lead, the guy who knew more about the technology and and the architect who came up with the solution, so, although you know, at that time like Vadim said, you, you weren't called an architect.
*ROB BARROW 25:29
The role didn't exist at that stage, did it?
*[redacted] 25:30
No, it didn't, and you definitely didn't, yeah, you weren't called an architect, but ah, there was you know, definitely architecture work. And then, after that, ah there wasn't much, many, much more highlights there, I, I was planning to, you know, emigrate and so I came to Australia in 88 um, and ah, I joined Honeywell Bull, and worked in ah, research, it was, it was a research centre that had just formed ah, with, at the time of the partnership agreement with the government that lots of companies were putting there, there was tax advantage to put ah, research centres right, and it wasn't necessarily, you know, strictly research ah, work, it was ah, it was kind of like a development lab but, but I don't know, it's hard to say whether it was you know, strictly research, but ah, the, the work was mainly in the network management area, so, you know, at that point I also used my expertise in that ah, that set of technologies, that Honeywell Bull based technologies, so I was ah, leading a group of people doing development. So we're doing like a joint development with another centre in Toronto, so we were kind of putting together a, a network management system and we're doing different components, so I was leading the component here, in ah, that we were developing in Melbourne, and um, then that project finished and I moved on to another ah, network management related project. It was a, a product that we were doing um, to ah, basically it was a netbox network for, ah for, it

was a general product but it, it was our main customer here in Australia, so that, that's why the development, the development started in the US but then got moved to, to Australia. Ah, and, and there I got back to actually doing development so I started developing in different languages, we were doing C and C++, and you know, doing Windows development and, and ah, ah, development under a Unix like ah server environment, um, and then from there I went again up, I kind of went up and down in terms of, you know, coding, and then doing architecture work, and then coding again, and then going back to doing team leadership, architecture work. So I worked at, I worked on ah, projects for, for clients, um which was not so much focused on, on product development ah. That was kind of towards the end of ah, my work with Honeywell Bull, it was in 93 ah, 95 I left and I went ah, like contracting, ah you know, independent contractor.

ACTV

ROLE / ACTV

EXPM

*ROB BARROW 28:38

Was there a particular focus in, in certain industries?

*[redacted] 28:41

Um, well up to that point I had the finance industry, then what I would call the IT industry because the network management ah, particularly the first experience with the network management product was really to manage a, a IT network, so there wasn't any industry in particular, it was you know, the IT industry, ah, um, and then a lot of ah, telecommunications after industry, particularly in Australia.

SECT

SECT

*ROB BARROW 29:12

VALD So that the strengths of both of you, or that the, the industries in which you've had lengthy experience would both be the telcos?

*[redacted] 29:19

SECT Telcos and finance.

*[redacted] 29:20

SECT Finance

*[redacted] 29:22

SECT Yeah, and then yeah my first probably 10 years in, in Australia, probably more, maybe 14 years were more, mainly telco, but the last 3 or 4 have been finance.

*ROB BARROW 29:37

And that's since working with [redacted]?

*[redacted] 29:40

Since, yes, since working for [redacted], so, yeah, I, I was contracting since 95 um, working in ah, enterprise architecture group, and, and I went across to [redacted] in 90, mid-97. Um, so I've been working with [redacted] since then. And yeah, since, since ah, 95 I've been pretty much focused on architecture work, so some enterprise architecture work, ah, mainly at the beginning of that period so that, the work I did ah, as a contractor and then ah, when I went across ah, to [redacted], I started managing a group, an architecture group, and um, you know, spent about 2 and a half years in that job and I built up that group into um, you know larger um, capability and competency, yeah.

EXPM

ROLE EXPM

ROLE EXPM

*ROB BARROW 30:42

Competency, that's the buzz word?

*[redacted] 30:45

[INDISTINCT], muffled

*[redacted] 30:49

It was about, yeah, the [INDISTINCT] cause I was working for Oscar so at the time so..

*[redacted] 30:53

So, that's the group that, that Oscar was describing, so we were working, it was a kind of a link between the enterprise architecture and the actual um, solution, solution architecture, so we were working with the enterprise architecture um, groups ah, and the technologists looking at, you know, what technology was more appropriate um, doing product assessment and doing, doing sort of enterprise architecture work and then we were applying that to actual solution architectures, so we had consulting architects that worked with the projects and, and helped them to align and, and, and use those

ACTV

*ROB BARROW 31:36

So the architecture of their solutions would have to fit in with the enterprises that you'd developed?

*[redacted] 31:41

Yes

*ROB BARROW 31:42

Effectively
*[redacted] 31:43
And, and we would help them cause a, often the gap is at the enterprise GAP
ACTV architectures are, the enterprise architects are up there, issuing policies and drawings and stuff, and the solution are here ignoring them. So.
*[redacted] 31:57
GAP Actually, bitterly ignoring them. CULT (GAP?)
*[redacted] and [redacted] 31:59
[Laughter]
*[redacted] 32:00
So, our group was, you know, there was senior people that could do enterprise architecture who would understand that and were also able to understand you know, the, the intricacy of actually implementing some of those concepts, and, and helping those projects to do so
*[redacted] 32:17
And in many cases it went down to the final stage, like you know, people would specializing in particular ah, technology areas ah, and then they would start off as ah, you know, um, doing some solutions and some developing, you know, ACTV some guidelines at the enterprise architecture level, but then would go to a particular project where opportunity would present itself and Oscar would refer them to a particular place and they would go and um, you know, turn this guidelines into design patterns or architectural patterns and go and actually do and, either oversee or actually actively take part in, in, in implementing these patterns as, as a proof of concept that would go into a particular solution and then later on would ah, find itself being promoted to enterprise architecture pattern. And that would, you know, numerous er, numerous cases ah, ah, were taking place you know, in the area of security, um, ah, you know, ah, ah, web development, um
*ROB BARROW 33:20
VALD Would it be fair to say, this is jumping ahead here, would it be fair to say that out of that sort of work, came some of the models of which the Method is comprised, these days - the [redacted] Method seems to be comprised of, what, 83 different, discrete methods for constructing systems in different problem spaces?
*[redacted] 33:48
My subjective feeling would be more "no" than "yes", I'd say.
*[redacted] 33:55
STRUC Yeah, the Method, cause the [redacted] Method is really a framework that was put together by [redacted] to um, to you know, consolidate all the methods into 1, PURP 1 framework so that, you know, cause before the Method there was like all sorts of different ah, methodologies or methods in, in, in different forms and you know, documented to different levels of detail and in different formats and so PURP on, so, so I was, it wasn't to come up with a new method necessarily, but to consolidate all the existing ones into one framework
*ROB BARROW 34:35
VALI With a consistent system of documentation and vocabulary?
*[redacted] 34:38
Yeah. So that, there is a metamodel which you're, you're aware of and that, that's how methods comply to that and you can kind of put it does, you know any, STRUC any method can be fitted in to this metamodel so there's, there's like if you look in the [redacted] Method, there's like methods to create a community of practice, in there as, you know, in the same model as the un, ah, the CAD or other system lifecycle
*ROB BARROW 35:10
Enterprise architecture type things?
*[redacted] 35:11
Yeah. So what I think, I think we get opportunities to provide feedback to the, CHAN the owners of the Method, so, you know, they do, do yearly, um, gathering of feedback from the field and we, would have, you know, provided some input that way, but what we did didn't actually make it in to a, a, engagement model, but there wasn't part of what we did, um, what, what we did do that might be relevant in terms of ah, method was that at the time we were in that group, the AMS ah, area, in [redacted] was, um
*ROB BARROW 35:53
AMS stands for?
*[redacted] 35:54

Application Management Services. They were, ah, working through the CMM
certification and one of the things that was part of that was rolling out the
Global Services Method across the two and a half thousand ah, people
organization, so, one of the things that we, we, as a group, helped that ah,
INDV initiative, by, ah, being ourself trained in the Method and becoming Method
CERT Exponents. Because, um, you know, the architect has, like probably the best um,
QUAL skillset and experience to be a Method Exponent, because, you know, by the
nature of the profession, you have to know um, I guess you have to be across the
RESP full lifecycle to understand what, what's required across the full lifecycle,
and you tend to know more or less, you know, what all the Work Products are
about and why you would do them and why you don't, as opposed to a specialist
that might know that about you know, how to go about doing design and
development, but may not, may know nothing about the business domain or the
architecture domain, or testing or so forth. So myself and all the senior
INDV people in the group, we are trained in the Method, became Method Exponents, and
CERT what we used to do was run Method, Method Adoption Workshops with other trainee
ACTV Method Exponents and help them, you know, develop their skills
*ROB BARROW 37:29
VALD And coach them in the Method
*[redacted] 37:30
ACTV Yeah, so we'd run, you know, do as many, as many MAMs with them as necessary to
get them confident to do them, do them on their own, so we, at that time we
build a Method Exponent Network of, you know, quite a few people, I can't
remember exactly, but it was
*[redacted] 37:44
Yeah but I think by now
*[redacted] 37:47
It may have been 15, 20 Method Exponents
*[redacted] 37:50
And, and plus, from the architectural perspective, almost all senior architects
now are trained Method Exponents ah, I think so that would be a fairly large
number
*[redacted] 38:01
Yeah
*ROB BARROW 38:02
Can I come back then to the general issue of methodologies and perhaps first
with you Vadim, prior to joining [redacted] what was your exposure to methodologies -
were there particular um, that you were using um, in your work? If so, what
were they?
[redacted] 38:25
Well, beyond um, I guess, IT area, a, cause, as I said, I come from ah, research
background, obviously, ah, research methodologies played always very important
STYL role in, in my approach to things, but, that would be on more, larger, you know,
or hard, prospective you know, not necessarily IT focused or IT specific, um,
ah, from and I guess before ah, getting exposed to [redacted] Method
my, well, first of all I never, never doubted ah, the, you know, the role and
STYL importance of methodology in IT work, but I must admit that my, like
retrospectively looking at that time I, I must admit my understanding of
methodology was never than, than you know at, than that at a later stage because SCOP
STYL I was more focused on what we currently call design methodologies rather than
engagement methodologies, cause, you know, the difference between ah, methods
like RUP or [redacted] Method or MethodOne or you know, you know, you
name it, um, is that these methods, they tackle engagement models which says
"Okay, well how do I with my clients and with my partners and, you know, um, my SCOP
collaborators, and collaborators, so that my final deliverable is delivered in
more effective way that corresponds to customer requirements at, you know in
many aspects, not necessarily in IT aspects and project management aspects or
domain, in you know, in this business strategy domain or business processes
domain and many other aspects?" Whilst I was concentrating before getting
exposed to these methods, engagement methods, I was ah more focused on design
methodologies like, okay structured method, okay, well you know, we all read NAMS
Yourdon and you know, you know, all the classical literature, and ah, ah, ah, SCOP
than looking at object oriented approaches as they evolved obviously, okay NAMS
saying okay well that, that method ah, of modelling um, reality you know how, um
this is applicable and how can be applied in more ah, commercial environment,
um, obviously ah, my background in, in database design and object modelling got

Appendix J Document Summary Form Template

DOCUMENT SUMMARY FORM

Site	
Document Title	
Date of Acquisition	
Received From	

Event or Contact With Which Document is Associated		**Date**	
Significance or Importance of this Document			
Brief Summary of Contents			
Action			

Appendix K Sample Artefact Comparison Records

CASE ARTEFACT COMPARISON RECORD

Artefacts Being Compared							
File 1	FICM Deliverables Dependency 070227 V5.0.vsd	Date/Time	28/02/07 19:42	**Traces To**	Email #: NONE	Date/Time	
File 2	FICM Deliverables Dependency 070228 V5.0.vsd	Date/Time	01/03/07 15:01	**Traces To**	Email #: NONE	Date/Time	

Phase	Solution Outline

File 1 FICM Deliverables Dependency 070227 V5.0.vsd	**File 2** FICM Deliverables Dependency 070228 V5.0.vsd	**Difference(s)**	**Magnitude of Change**	**Impact of Change**	**Type of Tailoring**	**Initial State**	**End State**
		1. Structure of the file has changed significantly. First version consisted of a single page, organised into columns representing the lifecycle phases. The second file consists of 6 pages, each of which is devoted to a single lifecycle phase. This shows the interconnections WITHIN a lifecycle phase, but does not show those which cross phase boundaries.	3 - Medium	3 - Medium	Contingent	Methodology-as-Anticip	Methodology-as-Antic
		2. Significant change to "Release Planning & Specification" phase. OzTel RDDs now primary input	3 - Medium	4 - High	Contingent	Methodology-as-Anticip	Methodology-as-Antic

	into "Release Definition - Requirements Specification" which is now defined as consisting of: a. "Release Objectives" [NEW] b. "Business Context" [NEW] c. "Release level System Context" [NEW] d. "SO Process Model" e. "Non-Functional Requirements" f. "Release level User Profiles" [NEW] g. "Release level Use Case Model" [NEW] h. "OzTel LRUE Requirements" i. "Classified Business Terms" [NEW] j. "Business Rules Catalogue" [NEW]					
	3. Release Definition - Architecture deliverable, previously shown as atomic in nature, now identified as consisting of: a. "Release level Architectural Decisions" b. "Release level Architecture Overview Diagram" c. "Release level Component Model" d. "Release Level Operational Model" e. "Services Model"	3 - Medium	3 - Medium	Contingent	Methodology-as-Anticip	Methodology-as-Antic
	4. Added "Component level Objectives" and "Component level Use Case Model" work products to the "Release Planning & Specification" phase	2 - Low	2 - Low	Contingent	Methodology-as-Anticip	Methodology-as-Antic
	5. "Release Definition - Architecture" composition elaborated upon to include:	4 - High	3 - Medium	Contingent	Methodology-as-Anticip	Methodology-as-Antic

	a. "Release level Architectural Decisions" b. "Release level Architecture Overview Diagram" c. "Release level Component Model" d. "Release Level Operational Model" e. "Services Model" f. "Release level Data Architecture" [NEW] g. "Release level Security Architecture" [NEW] h. "Release level LRUE Compliance Response" [NEW] i. "Release level SOE Compliance Response" [NEW] j. "Release level Sequence and System Interdependencies" [NEW]					
	6. "Component Architecture Definition" deliverable shown decomposed into: a. "Component Level Context" [NEW] b. "Component Level Architecture Overview" [NEW] c. "Sub-Component Model" [NEW] d. "Component Level Data Architecture" [NEW] e. "Component Level Operational Model" [NEW] f. "Component Level Security Architecture" [NEW] g. "Component Level LRUE Compliance Response" [NEW] h. Component Level SOE Compliance Response" [NEW] i. "Component Level Architectural	3 - Medium	4 - High	Contingent	Methodology-as-Anticip	Methodology-as-Antic

	Decisions" [NEW]					
	7. "Training Needs Analysis", "Idea Assessment", "Feasibility Assessment", and "Detailed Assessment" which were previously shown as isolated work products, are now shown as inputs into the "Component level RTVM" in the "High Level Design" phase	2 - Low	3 - Medium	Contingent	Methodology-as-Anticip	Methodology-as-Antic
	8. "Business Rules Catalogue" and "Release Use Case Model" added to "Detailed Design phase". BRC is an input into RUCM which is then an input into the "Release Definition - Architecture"	4 - High	3 - Medium	Contingent	Methodology-as-Anticip	Methodology-as-Antic
	9. New downstream artefact defined from "Release Definition - Architecture" consisting of: a. "End State Capability Model" [NEW] b. "End State Release Overview" [NEW] c. "End State Architecture Overview" NEW] d. "End State System Context" [NEW] e. "End State Component Model" [NEW] f. "End State Operational Model" [NEW] g. "End State Component Architecture Overview" [NEW] h. "End State Component System Context" [NEW] i. "End State Sub Component Model" [NEW] j. "End State Component Operational Model"	4 - High	4 - High	Contingent	Methodology-as-Anticip	Methodology-as-Antic

	10. "System Availability Plan" and "Application Recovery Plan" work products removed from "Detailed Design" phase and moved to "Construct" phase	2 - Low	1 - Very Lov	Contingent	Methodology-as-Anticip	Methodology-as-Antic

Appendix L Summary of Application of Structured-Case

Each cycle of research undertaken within the structured-case framework includes a planning phase, a data collection phase, and data analysis phase, and a reflection stage (see Section 3.4.2.1) (Carroll and Swatman 2000). Table 20 below summarises this.

Table 20 - Summary of Structured-Case as Executed in Research Cycles 1, 2 and 3

STRUCTURED-CASE COMPONENTS	DESCRIPTION	APPLIED TO THIS RESEARCH
Plan	Research design is planned including selection of cases/participants, research and data analysis methods.	Identification of candidate case projects. Observation of Method Adoption Workshops (MAWs). Semi-structured interviews to be conducted with key participants in MAW sand observation. Preliminary interview protocol drafted. Participants are IT professionals typically aged from their mid-30s to early 60s who are advanced technology users.
Collect	Collect and record data, guided by the planned research design.	Observe and audio record MAWs. Capture artefacts produced prior to, during and subsequent to MAW for analysis. Interviews are audio-recorded. Field notes are made of all interactions.
Analyse	Analysis begins in the field as data are collected. It continues afterwards. Analysis involves iterative data organisation and reduction through coding and graphical representations.	Key tailoring events identified. Key transitions between tailoring states identified. Narrative constructed. Modifications to conceptual framework identified.
Reflect	Reflection and critical analysis of the research process and tentative findings to build theory. Revised understanding of the key concepts and relationships relating to the research themes is expressed in a Conceptual Framework that is the basis for the next research cycle.	Search for alternative theories/concepts and explanations for data. Three states of a methodology, and the two types of transition between them provides a good fit with the data. Some data which is potentially contradictory/disconfirming or which is open to interpretation but insufficient to invalidate the partially validated conceptual framework.

Appendix M Artefact Comparison Record Template

Artefacts Being Compared							
File 1		Date/Time		**Traces To**	Email #:	Date/Time	
File 2		Date/Time		**Traces To**	Email #:	Date/Time	

Phase	Solution Outline

File 1	File 2	Difference(s)	Magnitude of Change	Impact of Change	Type of Tailoring	Initial State	End State
			3 - Medium	3 - Medium	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
			3 - Medium	4 - High	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
			3 - Medium	3 - Medium	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
			2 - Low	2 - Low	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated

		2 - Low	2 - Low	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		4 - High	3 - Medium	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		1 - Very Low	3 - Medium	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		3 - Medium	4 - High	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		2 - Low	3 - Medium	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		1 - Very Low	1 - Very Low	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		4 - High	3 - Medium	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		4 - High	4 - High	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		4 - High	3 - Medium	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		2 - Low	1 - Very Low	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		2 - Low	2 - Low	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		3 - Medium	3 - Medium	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		1 - Very Low	3 - Medium	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		3 - Medium	4 - High	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		1 - Very Low	2 - Low	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		1 - Very Low	4 - High	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		3 - Medium	3 - Medium	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated
		1 - Very Low	3 - Medium	Contingent	Methodology-as-Anticipated	Methodology-as-Anticipated

Appendix N Data Source Audit

Note: Sources are codified according to the Scheme presented in Appendix D

<table>
<tr><th>Tailoring Event Number</th><th>Event Description</th><th>Source</th><th>Exhibits (indicative of statements collected from the relevant sources, as listed in Appendix L)</th></tr>
<tr><td>1</td><td><table><tr><th colspan="2">Methodology States</th><th rowspan="2">Form of Tailoring</th></tr><tr><th>Initial State</th><th>Final State</th></tr><tr><td>Methodology-as-Documented Library</td><td>Methodology-as-Documented</td><td>Contingent</td></tr></table>This episode of tailoring related to the selection of the "Custom Application Development" (CAD) Delivery Process as the program level Methodology-as-Documented. This selection was based on an understanding of the type of project and on the features, influences and constraints of the project known at that time.</td><td>Method Exponent Interviews</td><td>Interviewer: One thing which isn't clear to me from looking over the emails is what was behind the decision to adopt the Custom Application Development Delivery Process as the foundation for the Methodology-as-Documented? After all, you already had identified a constraint in that you were obligated to implement a set of packages. Why that Delivery Process and not, for instance, Sysco's Package Selection and Implementation Delivery Process?

ME-1: It's true that OzTel expected us to implement a number of packages, but it was even more important to them that they got the expected business capability delivered. You've got to remember that one of the catch phrases for the program was to provide a "one click" experience. Key to doing this was developing the integration to tie all of these packages together. Without that, there isn't a coherent business solution.

The assessment early on, and I think it will be shown to be correct as the program proceeds, the assessment was that there was more work involved in building custom interfaces between</td></tr>
</table>

			the packages, and so CAD was selected. ME-4: It's not just integration between packages. There is also a lot of integration to be done between the legacy applications which are staying, and the packages, so CAD seemed like a good choice.

<table>
<tr>
<td rowspan="2">2</td>
<td rowspan="2">
<table>
<tr><td>TeleTransform Program Methodology-as-Documented</td><td>TeleTransform Program Methodology-as-Anticipated</td><td>Contingent</td></tr>
</table>
This episode of tailoring resulted in modification of the initial Methodology-as-Documented in order to align the commercial objectives of the program with the approach to development.
</td>
<td rowspan="2">Informal MAW Observation</td>
<td>Meeting held between ME-1, ME-4 and ME-8, 14 November 2006:
Topic: incorporation of the QAM into the tailored ISDM for the OzTel Transformation

Note – ME-8 was located in another city, and participated in the MAW via telephone

ME-8: Guys, we have to figure out how to roll QAM into the delivery approach- and we have no choice. This project is so big, with so many moving parts and so visible we've been told that Sysco has to make sure everything lines up.

ME-1:</td>
</tr>
<tr>
<td>Meeting held between ME-1, ME-4 and ME-8, 17 November 2006:
Topic: refinement of the QAM being incorporated into the tailored ISDM for the OzTel Transformation

Note – ME-8 was located in another city, and participated in the MAW via telephone

ME-8: I initially thought that a BRR would not be needed, but that was because I believed we understood the OzTel context and need quite well. However, given the amount of prevarication going on, I am not so sure.

The idea of having a BRR is to ensure that we do</td>
</tr>
</table>

			have an adequate understanding and baseline of the business requirements. Not having business requirements is a problem that is not solved by omitting the BRR but by producing the business requirements in the first place. The technical governance document has the detailed QAM criteria for the BRR and other reviews ... so you can see what is actually being assessed. Understand that the intent here is to firm up our understanding of our obligations as early as possible and the BRR is the way we get client agreement of those. ME-4: So we're agreed then, that we run the entire suite of lifecycle reviews? BRR, SRR, PDR, CDR, TRR, and PRR? ME-1: Agreed, but there'll actually be many of them: release level, domain level, test phase.

		MAW Participant Interviews	Interviewer: I want to come back, again, to the decision to select the Custom Application Delivery Process and not something else. You've talked about needing to supplement CAD with other work products. Can you give me some examples of the types of things which were needed? ME-4: Sure. Before I do, it's important to remember that an "out-of-the-box" delivery process is never ready to go. I mean that it's never ready for use. In my experience it ALWAYS requires tailoring. You know, no two projects are ever the same, even if the problem type is similar, there will be differences in client organisation, schedule, budget that all get reflected to some degree in the method. In this case, there's a bunch of packages to be deployed. And one of the key things with packages is they need to be configured. But CAD doesn't have anything in it covering configuration – no tasks, no work products. So there's an example where successful delivery, governance of the solution, required supplementing the base method with material from another delivery process. For something like this, you know, we've done it before. We've got lots of experience with SAP for instance. So you know when you're engaged, that, especially if it's integration of packages,

			that you're probably going to have to configure. So this kind of makes you sensitive to the need and if it isn't expressed, to ask.

			Interviewer: During the MAW, ME-8 mentioned that There was no choice in using QAM. He said something like the project was too big and had too many moving parts. What did you mean by that? ME-8: Well, firstly, this is a huge program of work. It touches every part of OzTel's business, and replaces a large number of bespoke legacy applications with packages. But we're the Systems Integrator. We're using packages we didn't select, and vendors to implement them that we haven't worked with before. So we need to keep them on a tight leash. We also need to make sure we limit what we do to the contract. QAM will assist in that. Interviewer: So you more or less knew coming in that you'd need to include this? ME-8: Yes, we knew about the mandate. But it's only since the details have become clearer that the extent of the need became known. Interviewer: So it's not as this came up suddenly? You knew about it coming in? ME-8: More or less. In any case, we're only trying to define the approach now, and to get agreement for that with OzTel. Because we don't own the relationships with the package

			vendors – they do – so we need to get their buy in. Interviewer: What I'm asking, I mean, what I guess I'm trying to get to, is whether or not you knew about this coming in or whether it was something that came up you had to accommodate? What I've heard is that you more or less knew about this requirement coming in? So it wasn't as if this was suddenly sprung on you and had to respond? ME-8: That's right.

<table>
<tr>
<td>3</td>
<td>
<table>
<tr><th colspan="2">Methodology States</th><th rowspan="2">Form of Tailoring</th></tr>
<tr><th>Initial State</th><th>Final State</th></tr>
<tr><td>Program level Methodology-as-Anticipated</td><td>Program level Methodology-as-Anticipated</td><td>Contingent</td></tr>
</table>
This episode of tailoring related to the modification of the program level initial Methodology-as-Anticipated to produce additional program level instances of the Methodology-as-Anticipated.
</td>
<td>Method Exponent Interviews</td>
<td>Interviewer: ME-4, as I looked over the email trail covering the development of the OzTel method, I noticed some stuff moving around and changes to inputs and dependencies, particularly early in the lifecycle.

ME-4: Right.

Interviewer: So for example, if you compare <<key data file 249>> with <<key data file 250>>, I found that there'd been a change. There was a new input into the "Release Definition – Requirements Specification" work product in the Release Planning & Specification phase: you now expected OzTel to supply a "Release Requirements Definition Document" as an input? Is that the case? Why did this change come about?

ME-4: There's a number of reasons for this, but first you have to understand the reasons that Sysco has for using method in the first place. One of them is to provide some certainty that we know what we have to deliver, and if possible, to get agreement with the customer on that. Not the sort of contractual level understanding, but more fine grained. So you could say one of the roles of method is to try to contain or control scope and commercial risk.

Now if think of it in that way, then what was behind this change was trying to lock that down.</td>
</tr>
</table>

			You know, putting the heavy lifting in up front. By getting OzTel input in the form of the RDD, we're getting them to be clearer about what they want. Coz, often, you know, they don't have a clear idea. Interviewer: So is that the reason then for the components of that work product? You know, things like the Release Objectives, System Context, Process Model and so on? ME-4: Of course! It's all about getting clarity about what has to be done, to be delivered. Interviewer: OK, that does make sense. But here's what doesn't. If getting that clarity is so important, why isn't this part of the documented method? ME-4: Well not every project we do is for OzTel. I mean, it's a big account, but it still doesn't mean it has a method tailored for it. So this is one of the things that happens at the start. But don't focus on the names of specific inputs and stuff, because they're going to vary from project to project. Think instead about what we're trying to do. And we should be refining our understanding of our obligations on every project. Interviewer: So, I'm trying to understand the process here. You've had a lot of experience

			working on OzTel projects? ME-4: Yes. Many years since joining Sysco. Interviewer: And ME-1, he's the same? ME-4: Yes, and ME-8 worked for them before he joined Sysco. Interviewer: So if I go back to what you said a couple of minutes ago, where you said something about confirming what you have to do on every project, so this is basically what you were doing? And based on your experience working on OzTel jobs, you knew what the input would be? ME-4: Yes. Interviewer: I'm still a little confused here though. Why wasn't this included in the first cut of the method? I mean, why did it take until now for this change to occur? ME-4: [Laughs] Well, the three amigos are trying to transform OzTel, you know, to change not just IT, but the culture of the business. I guess part of what's behind it is to cut costs, so initially they thought they could reduce costs on the program by not producing an RDD. But we really thought it was prudent from our perspective to insist on it.

			Interviewer: So you were expecting it? The RDD as an input I mean? You were anticipating it and planning for it? ME-4: Yes. We don't work in isolation when we tailor the method. Particularly in the planning phase. We deal with our sales team for instance, so we get a "heads up" as to what we're on the hook for and so we can plan for it.

<table>
<tr>
<td>4</td>
<td>
<table>
<tr><th colspan="2">Methodology States</th><th rowspan="2">Form of Tailoring</th></tr>
<tr><th>Initial State</th><th>Final State</th></tr>
<tr><td>Program level Methodology-as-Anticipated</td><td>Domain level Methodology-as-Anticipated</td><td>Contingent</td></tr>
</table>
This episode of tailoring related to the modification of the initial program level Methodology-as-Anticipated to produce an initial (and subsequent) Customer Service Assurance domain-specific instances of the Methodology-as-Anticipated.
</td>
<td>MAW Participant Interviews</td>
<td>Interviewer: Can I ask now about what I'll call a change in granularity in the method?

ME-1/ME-4: Sure.

Interviewer: It seems to me that by the time you get to <<All_Files 315>> you're drilling into more detail. So I start seeing references to domain and component level instantiations of things that I hadn't seen before?

ME-4: Do you want to answer that ME-1? Or will I? [Doesn't wait for answer] Oh, alright then, I'll answer.

Tailoring is never wave your magic wand once and sim sala bim, it's done. Especially on something like this.

Interviewer: Something like this? What do you mean?

ME-4: This is a VERY LARGE (raises voice for emphasis and waves arms) program of work. So tailoring of the method happens iteratively.

We start out knowing what the contract says we have to do, then select a Delivery Process to base stuff on. Then find gaps and fill them with stuff from other Delivery Processes. And often that's as far as you'll have to go.</td>
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			Interviewer: But not here? ME-4: No, not here. It's too big. Too complex for that. We've got multiple releases over many years. We've got multiple functional domains in each release. We've got multiple packages being implemented by multiple sub-contractors. And the subbies have varying levels of maturity as far as method is concerned. Some have their own methods, some don't. So we have to deliver certain things to OzTel, and we need input into many of these from the subbies, so method helps explain to them what we want, when we want it, and to make them understand the form that they have to provide it to us in. Trying to handle all of this complexity in one round of tailoring is impossible. So we come up with a high level view of it, you know, like a program level view. Then we identify those bits that have to be produced in each release, and then those that have to be produced for each domain and each component, and build up the detail that way. Interviewer: So that's why, I mean, it's possible, that when you produce an instance of the method for a domain, that it includes additional things not present in the program method, or excludes things present there? ME-4: Correct! Method is like an onion, there's

			lots of layers. We need a big onion for this program because it's so complex. It's only as we dig deeper into the onion that the detail we need emerges. So, what we started with wouldn't have been enough for a PM to build a schedule from, but after a couple of iterations, we're getting there. Interviewer: So that's what drove the decision to split what was originally described as "Test Plan Packages" into finer grained things? ME-4: Yes. It's also why you start to find things moving around. Well, not so much moving around. Am I making sense? [Laughs]. What I mean is, you take something like the "Application Recovery Plan" work product. This had originally been placed in the Detailed Design phase – and that's because that's where it's positioned in the Delivery Process we based this on. But, and this is important, while a component level version of this might be ready then, we have to roll it up into a domain version and then into a release version, and that certainly won't all be ready then. So then endpoint- the delivery if you like - of the work product is moved into the Construct phase. Interviewer: But what isn't obvious to me here, maybe I'm just not seeing it, is whether this is something that just "popped up" that you responded to almost as a matter of urgency, or

			whether you saw it coming and could in effect, prepare for it. ME-4: It's like I said before - trying to handle all of the complexity at once is impossible. And we've done this before. So we know where issues are likely to pop up and can anticipate and prepare.

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<tr><th colspan="2">Methodology States</th><th rowspan="2">Form of Tailoring</th></tr>
<tr><th>Initial State</th><th>Final State</th></tr>
<tr><td>Domain level Methodology-as-Anticipated</td><td>Domain level Methodology-in-Action</td><td>Improvised</td></tr>
</table>
This episode of tailoring related to the modification of the initial (and subsequent) Customer Service Assurance domain-specific instances of the Methodology-as-Anticipated to develop and execute a domain level Methodology-in-Action.
</td>
<td>Formal MAW Observation</td>
<td>ME-1: I think we should get started given we only were able to get the room for three hours.

I'm [ME-1], the Method Exponent, and I'll be facilitating this MAW. The aim of this workshop is to review the CSA domain method I've prepared so that we can determine whether it gives you guys what you need to guide your development.

So, this has been created by myself and ME-4, using the high level program method as an input, and it's sort of been shaped by discussions we've had with RITA-4 along the way.

What we need to do today though is get agreement on does it, you know, cover everything that's needed? Is the WBS detailed enough? Are the roles and responsibilities spelt out? Can we develop a schedule and budget from the WBS? Pretty standard sort of stuff really, you know.

RITA-4: ME-1, something that I should bring up up front. OzTel have informed us that the CSA End State Solution Architecture won't be available to us.

ME-1: OK, I've noted that, I'm going to park that for now, until we get to the point where we start reviewing and making changes.</td>
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			ME-1: So RITA-4, the CSA SAD not being available – do we know why? RITA-4: We're not completely sure, but we believe it's because they are struggling to find architectural resources for the work. ME-1: Well, can we focus on that, because from where we are now, the architecture we have to develop and get approved, that's potentially a big issue? RITA-4: ME-1, ordinarily I'd agree with you, but I'm not so sure that on this project it is. ME-1: Why? I don't understand. RITA-4: Well, it's not like this domain in this release is operating in a vacuum. We're sort of fenced in by the packages being used by us and the other domains in the release. You know, the interfaces they offer. And the other domains are specifying their architecture as well. Plus we still have the overall end state architecture to work to. ME-1: Are you saying that those things mean you don't NEED the CSA SAD from OzTel? RITA-4: Yes and no. [Laughs] Ideally, we'd still get them to provide architectural input, if only because that protects our position a little bit more. And because it provides another level of

			detail. But I think we can live without it. ME-6: But surely it's not as simple as just removing some objects from a Visio diagram? RITA-4: [Laughs] No of course not. But we have a strong governance framework in place already with QAM rolled into the method. And we're not just going to drop our architecture on them. I'd suggest we'll operate like we normally do – you know, we work closely with our OzTel peers, and socialise the architecture as we develop it. So in a way, we're getting the equivalent of the CSA SAD, just not in a documented form. RPM-3: I'd be happier with the CSA SAD being supplied, but I've got a date to meet, and the clock is running, so this approach may have to do. ME-1: So we remove the CSA SAD as an input into our architecture document? But we retain the other inputs right? The Requirements Specification? The Process Model? RITA-4: Yes, absolutely. ME-1: And since we're still producing the architecture document, then are the downstream work products affected at all?

			RITA-4: No, they shouldn't be. ME-1: RPM-3, you're okay with that? RPM-3: Well, if RITA-4 says the impacts can be managed, then I'm okay. But we need to get this decision and the method finalised today, because the gears are turning, and we'll be kicking this work off yesterday!

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</table>
This episode of tailoring related to the tailoring of the domain level Methodology-in-Action to generate an additional instance of the Customer Service Assurance domain Methodology-as-Anticipated.
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<td>Method Exponent Interviews</td>
<td>Interviewer: ME-1, there’s something here that doesn’t make a lot of sense to me. Can you explain that to me?

ME-1: I can try [laughs]

Interviewer: So within the CSA domain, you’d run a MAW, and made further changes to the Methodology-as-Anticipated. You’d defined a new version of the method, which actually began to be executed, right?

ME-1: Yes. Things were in a state where they had to be done yesterday, so in a way, we were retrospectively validating what had happened. We were also trying to get onto the front foot.

Interviewer: But what I don’t understand is AFTER the creation of the CSA Methodology-as-Anticipated and it was actually “in use”, there were further changes made? I mean, I’ve looked over the trail of emails that you and ME-4 have given me, and it seems as though stuff was being added AFTER that MAW I attended with you.

ME-1: Yes, that’s right, but let me explain. While work had started, there was still planning going on. There were still gaps in knowledge that had been filled by assumptions and experience. But work was occurring to actively close those gaps and as more information came to light it sometimes, not always but sometimes,</td>
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			drove more changes to the method. Interviewer: OK, so for example, the CSA Package Integration Model and CSA Service Profile work products were added to the method AFTER the MAW, and from what I can deduce, while project was in flight? ME-1: Yep. Interviewer: So how did you and ME-4 respond? ME-1: Well, without digging too deeply into it, you've got the emails for that [laughs], there were concerns that even after all of the tailoring that had occurred previously we were light on in the area of integration and services and that it needed to be beefed up. Plus you know, this program is all about integration and use of SOA and web services so it probably was a hole. So we identified work products from within the Sysco framework that could be used, and that's how we came up with the Package Integration Model and Service Profile. Then after looking at their purpose, because you know, the method website stores all of this and includes a description of each, its purpose and so on, we decided to include them.

			Interviewer: Include them in what? ME-1: In the method. Interviewer: But this is what I'm getting at. The method was already being used, being executed. ME-1: Ah, ok. I see where you're going. Well, method isn't linear. You know, they often evolve in all sorts of directions. So yes, this CSA method WAS being executed, but we went and modified it. Interviewer: So that was a change to what was in flight? Or a NEW instance? ME-1: You could look at it either way. But one consideration for us was we wanted to make sure that this knowledge was folded back into the CSA method so that it wasn't lost in later releases. Plus, don't forget that we were still in the Release Planning and Specification phase when these changes were made, but these work products were added to the High Level Design phase. Interviewer: So is it fair to say that you could see this as a change to TWO methods? ME-1: I don't follow you. Interviewer: Well, you've changed the in flight

			CSA method? ME-1: Correct. Interviewer: But you've also effectively changed the version you plan to use in the CSA domain in later releases? ME-1: Absolutely. Oh, I see what you're saying. Yes, that's right. Interviewer: And if I look at that second example, you're anticipating project conditions right? I mean, you're anticipating or assuming that things will be the same in CSA in later release? ME-1: That's right. Interviewer: So, you've planned for that in making the change? ME-1: Yes, I guess you could say that.

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This episode of tailoring related to the tailoring of the Customer Service Assurance domain level Methodology-in-Action to generate an additional instance of the program level Methodology-as-Anticipated.
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<td>Method Exponent Interviews</td>
<td>Interviewer: So is it the same learning then with folding back what you did in the CSA domain into the program generally?
ME-1: Yep, absolutely. See, the program is all about packages, and integration. So, you know, we addressed the problem with CSA, but every domain is implementing packages, and they all need to be integrated, and they all offer, or most of them offer, services. So we solved a common problem once in CSA and on reflection, it solved a problem across the program.
Interviewer: So did you just replicate what you'd one in CSA? I mean, was it a case of "Well I solved that problem there like this, so it will work everywhere else" or was there more to it?
ME-1: Well, yes and no. [Laughs]. See it's not like I've just started doing this kind of stuff. [Laughs] So, when I made the changes in CSA and knowing what I do about the program, and being old [laughs], I guess I was looking for other opportunities to leverage.
Interviewer: So folding this change you made in CSA back into the program wide method, that was not a knee jerk? You thought it through?
ME-1: <<Interviewer>>, I thought you knew me better than that! [Laughs]. No, like I said, I'm old. I've done this a lot. I've got a lot of notches on my belt. So you know experience kicked in on the one hand to identify the opportunity for reuse. But then, I actually DID think about its appropriateness. And then, that's when I</td>
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			realised, well, we're implementing this package here in this domain, and these packages in this domain and so on, and it's all full of integration within and between domains, so it's really the same problem. So there's probably no reason why, at least as a starting point, that the same solution wouldn't work.

Appendix O Publications Arising from this Research

Barrow, R., Frampton, K., Hamilton, M. and Crossman, B. (2004). How Do Experienced Architects Use Architecture Development Methods?, *Proceedings of the Australasian Conference on Information Systems*, Hobart

Barrow, R., Frampton, K., Hamilton, M. and Crossman, B. (2005). A Study of the In-Practice Application of a Commercial Software Architecture Method. *Proceedings of the Australian Software Engineering Conference*, Brisbane

Barrow, R., Carroll, J., Smith, R. and Frampton, K. (2007). The Application of an ISD Methodology in Practice – An Exploratory Study. *Proceedings of the Pacific Asia Conference on Information Systems*, Auckland

Barrow, R., Carroll, J. and Smith, R. (2009). Towards an Integrated Model of ISDM Tailoring. *Proceedings of the Australasian Conference on Information Systems*. Melbourne

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